Electrical West

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FOR
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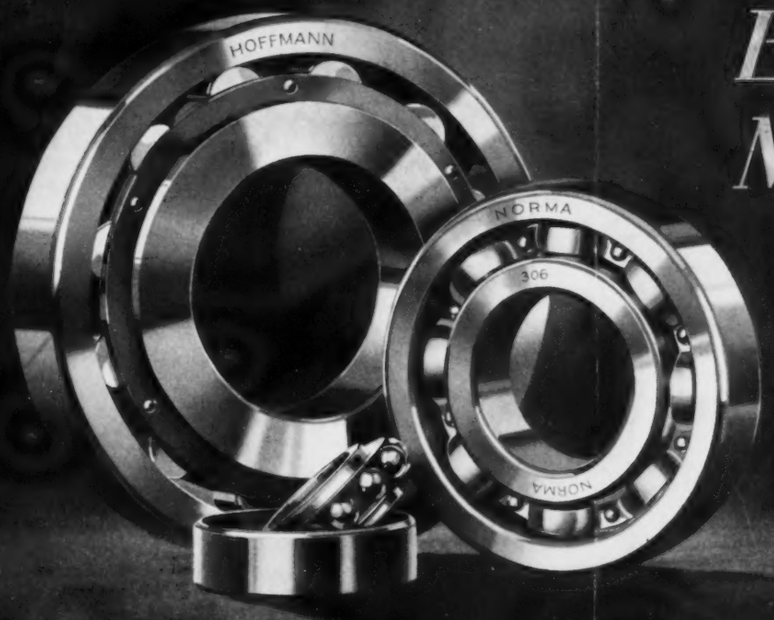

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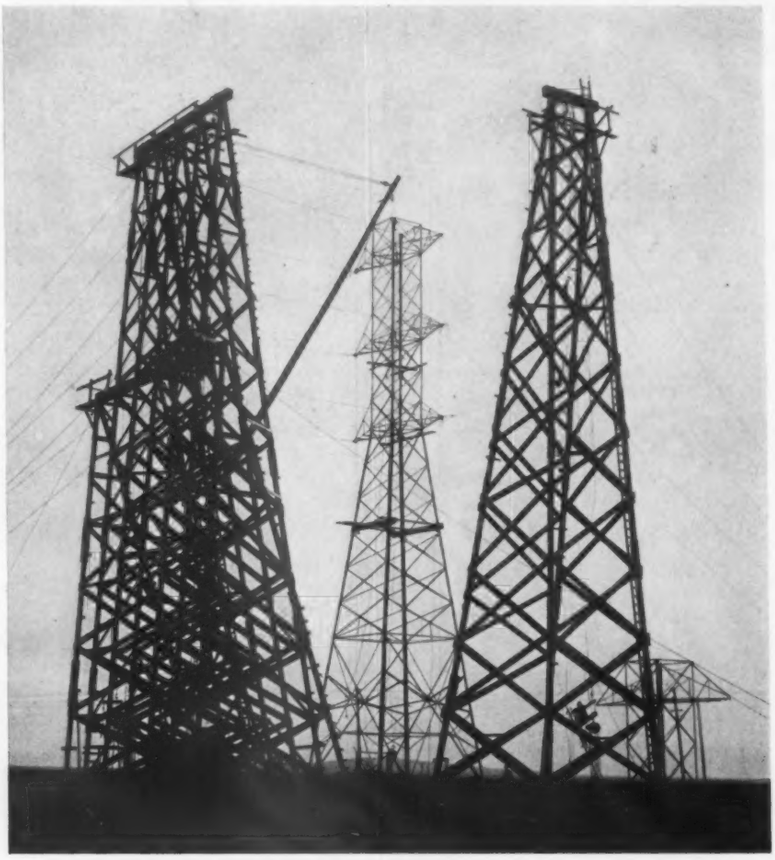

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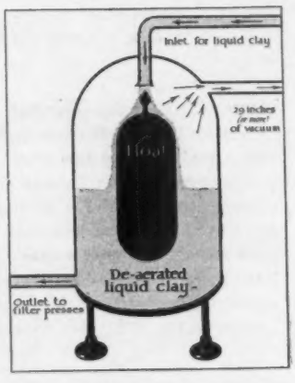

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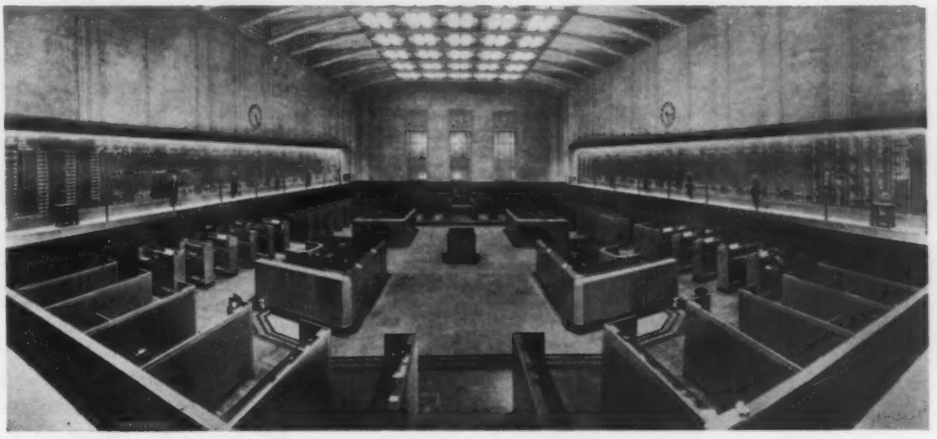


The trading room looking west from the visitors' gallery. The trading "facilities" are to be noted around the telegraph center in the middle of the floor, while the brokers' booths are around the four sides of the hall

By G. M. SIMONSON,
Consulting Engineer

LONG on LIGHT

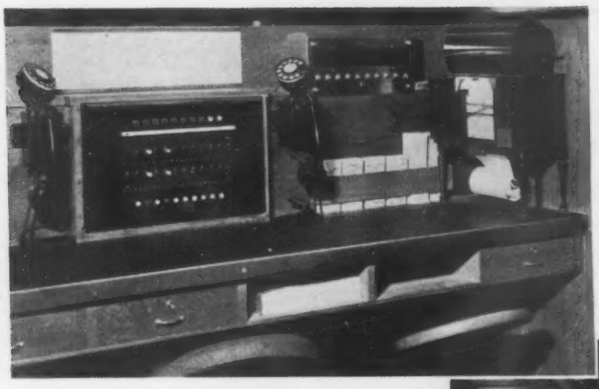
The New San Francisco Stock Exchange Electrically Is Far Above Par in All Respects

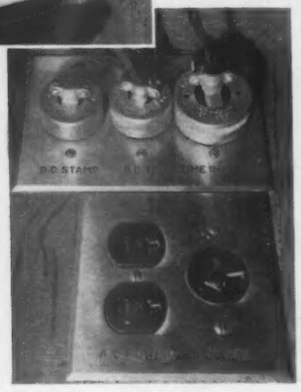
MONUMENTALLY beautiful in architecture and the last word in operating efficiency, the newly completed San Francisco Stock Exchange symbolizes the financial and business progress of the West. To keep pace with the high perfection of the entire plant the electrical systems had to be developed on a scale and in detail surpassing any previous practice.

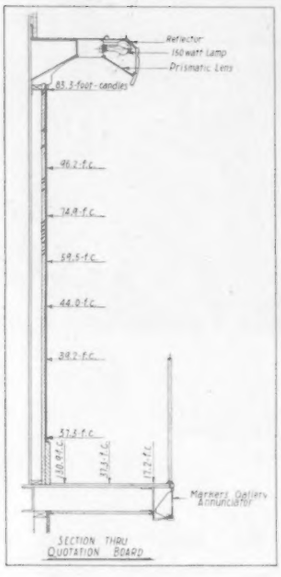
The United States Sub-Treasury Building was purchased and remodeled into a spacious trading room with the basement vaults retained. A twelve-story office building was erected in the rear of the Exchange for offices and other departments. The entrance to the office building is on Sansome St., with a grand staircase leading from the elevator lobby to the trading room lobby in the rear. On the second and third floors are class rooms, locker and shower rooms, and an assembly hall with a completely equipped stage and projection room. The fourth floor is occupied by the Stock Exchange Institute and the printing department. The printing department is completely equipped with modern printing presses, linotype machines and other equipment operated by direct current from a special panel board.

The fifth floor is occupied by the Clearing House. The sixth, seventh and eighth floors are rental floors and the ninth floor the executive offices of the Exchange. The tenth and eleventh floors are later to be occupied by luxurious club quarters, with a recreation space on the twelfth floor.

A transformer vault is provided under the sidewalk at the Sansome St. entrance. A bank of transformers with star-connected secondaries provides three-phase 120/208 volts for power and lighting distribution. The secondaries will be connected to the Pacific Gas and Electric Company's new low-voltage a.c. network, through network breakers, making this the first building in San Francisco to be so connected.







ABOVE: *Typical broker's booth showing telephone turret board, telephone instruments, booth annunciator and receiving telautograph instrument*

RIGHT: *D.c. and a.c. receptacles and locking plugs under each broker's booth.*

LEFT: *Sketch showing construction of lighting trough and foot-candle intensities at various points on the quotation board*

The main switchboard is located in the boiler room with light and power buses brought through the transformer vault wall directly to the switchboard. The low-voltage breakers in the transformer vault serve as main light and power switches with remote control switches and indicating lamps on the main switchboard. The power company's current transformers are mounted on racks in the vault with the meters on the main switchboard.

Direct current at 120/240 volts is brought through the transformer vault direct to the main switchboard. The connected loads for the building are as follows: Three-phase 208-volt power, 325 hp.; three-phase 120/208-volt lighting, 623 kw.; 120/240-volt d.c. power, 75 hp.; and 120/240-volt d.c. auxiliary power, 220 kw.

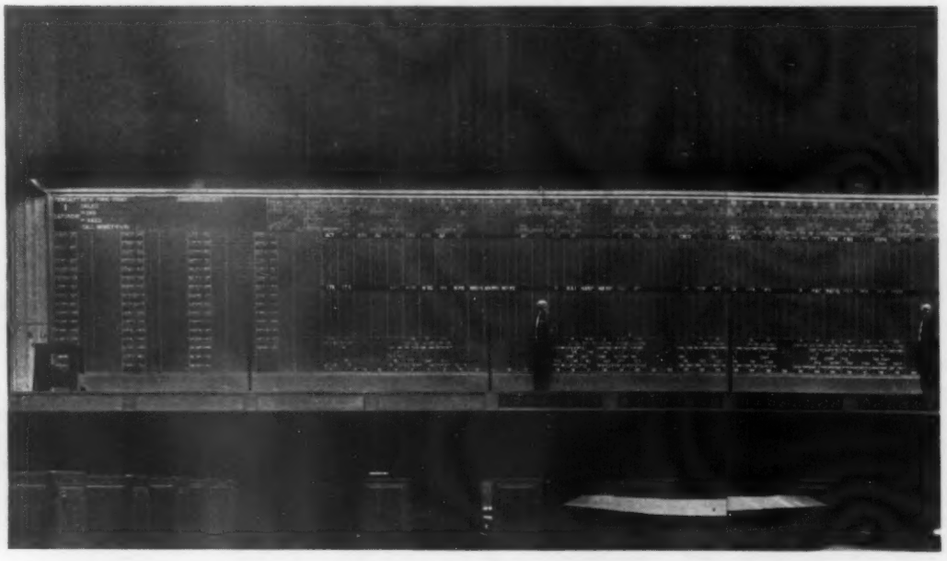
Feeders are installed from the main switchboard to fan room and pump room panels in the basement, fans in the trading room roof space, motion picture projection room, printing department and pent house elevators.

The motor-driven equipment includes an elaborate ventilating system for the trading room with air conditioning apparatus employing a 75-ton refrigerating machine and an air washer. Remotely controlled supply and exhaust fans for the assembly hall, governors' rooms and other important rooms are provided.

Conduits and cables for Pacific Telephone & Telegraph Company's telephones, Western Union stock tickers and messenger call circuits run through the riser cabinets on each floor of the office building.

Feeders rise through a riser space to panel boards on each floor, with a.c. lighting to all floors and d.c. power to the sixth, seventh, eighth and ninth office floors.

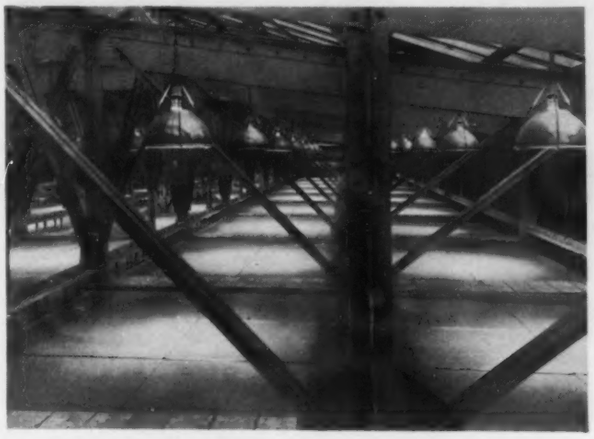
The office floors are provided with an underfloor grid system of Walker preset underfloor duct laid in double and triple runs on approximately 6-ft centers, lengthwise



North stock board showing the 5-ft. Telechron clock above Western Union tickers for receiving quotations, telephone head sets for broadcasting quotations, and 80-light annunciator in the face of the gallery

with the building and covering the entire floor area. These ducts provide facilities for telephone and signal wires, a.c. lighting or power, and d.c. power.

The lighting circuits are laid out in capacities in excess of three watts per square foot of floor area. The executive offices, clearing house and printing department and present occupied offices are provided with Guth total indirect lighting fixtures. In the printing department where the printing of sales records and other work must be carried on continuously with the session of the Exchange an average intensity of 35 foot-candles of total indirect lighting has been provided.



Lighting units above the ceiling panel of the trading room

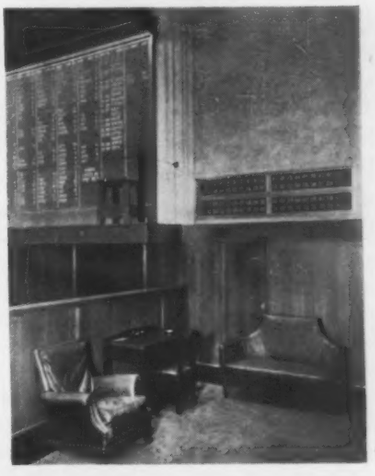
Trading Room

The trading room is 122 ft. long and 68 ft. wide, with a 40-ft. ceiling height. Around the sides are the brokers' booths in which are stationed the brokers' clerks and assistants. Orders from the brokers' offices are received at these booths for the purchase or sale or securities. These orders are transmitted to the traders for execution on the floor.

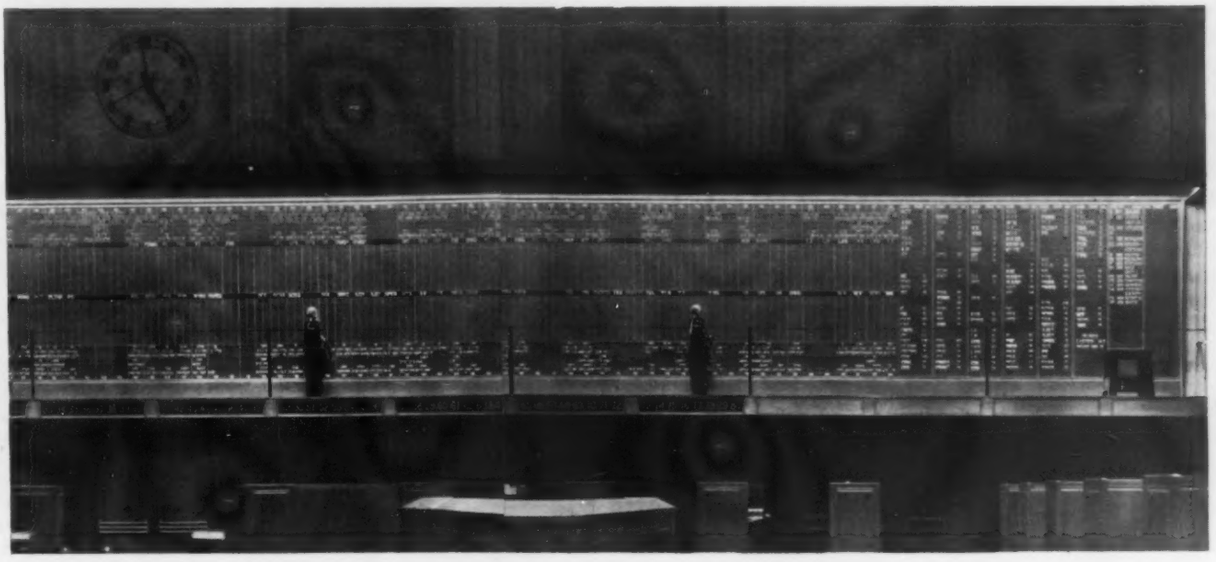
The trading floor is one step below the level of the booths. Four trading facilities are placed in the corners of this area where the specialists and odd-lot dealers make and maintain the market in the selected list of stocks assigned for trading at their respective posts and where they execute orders for other members.

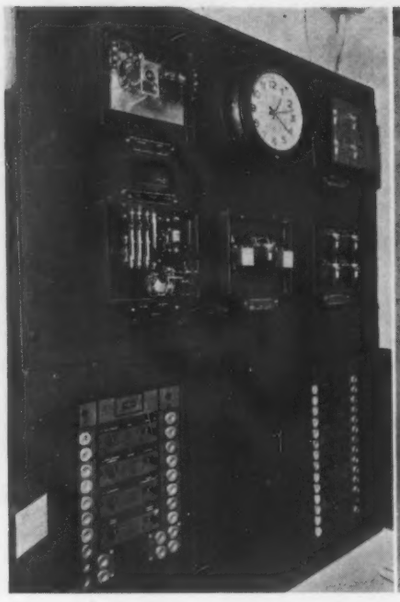
In the center of the floor the Western Union ticker transmission station is located. Each order is brought to this station and stamped with the exact time of receipt by electrically operated time stamps. The orders are then transmitted by high-speed tickers to the quotation boards on the markers' galleries, the Exchange printing department on the fourth floor, and to all brokers' offices in San Francisco and the entire Pacific Coast.

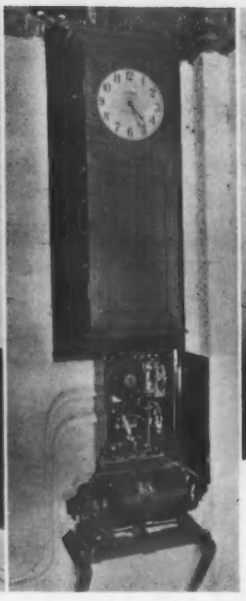
Duplicate quotation boards are located on galleries on the north and south walls with Telechron clocks above them. Adjacent to each broker's booth are five pneumatic-tube sending stations with receiving centers at each of the four trading facilities and the comparison room in the lobby. By means of this tube system orders are transmitted from one broker's booth to any trading post or to any other broker's booth through the nearest

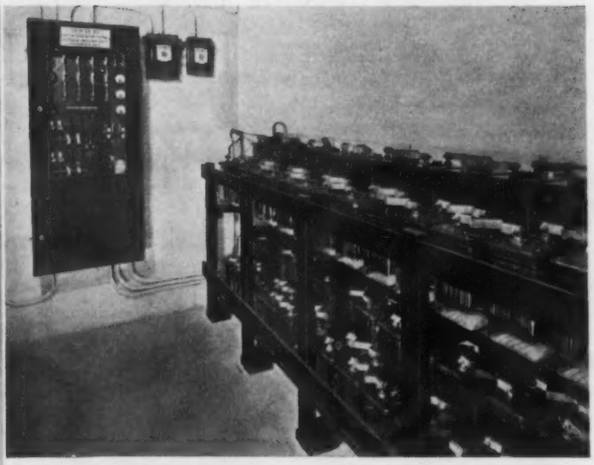


Members' lounge in the west end of the trading room showing the lounge annunciator, which also lights a member's number should he be called from any of several floor locations









LEFT: *Time system control panel showing master 6-sec. contactor in upper left, chronometric frequency generator control in lower left, indicator clock with minute and hour hands and 6-sec. hand in the upper center, and relay banks for time stamp circuits*

CENTER: *Program instrument, motor generator and frequency control apparatus*

ABOVE: *Emergency storage battery, transfer switch and battery charging panel*

trading facility tube center, thus preventing congestion on the trading floor. Buy and sell orders are verified as to detail between seller and buyer through the medium of the comparison room, from which point they are also transmitted by pneumatic tube to the clearing department.

In the lobby of the trading room the Western Union Telegraph Company, Postal Telegraph Company and Mackay Radio Company have offices for the convenient transaction of business to and from the Exchange. These telegraph services have terminal rooms in the basement. The floor manager's office, the comparison room and the Exchange P.B.X. also are located in this lobby.

The trading room is architecturally treated with acoustical plaster of a light grey color. The unique ceiling construction presented an unusual problem. The ceiling panel, 109 ft. long by 39 ft. wide, consists of a modernistic arrangement of crystalized finished metal fins, 12 in. deep and 5 in. on centers with interconnecting curved strips forming a lace-like pattern. Above these fins are clear wire-glass panels.

The room is illuminated by 55 Holophane high mounting height lighting units with 750-watt lamps and 20 300-watt units at either end of the ceiling panel to compensate for the shorter roof skylight above. The units are suspended 4 ft. 6 in. above the ceiling panel and are spaced on 8 ft. x 10 ft. 6 in. centers. These units have an intensive distribution which, combined with the metal fins, greatly reduces the vertical component of the light. The horizontal illumination at the floor working level is 25 foot-candles.

The circuits for the trading room illumination as well as the quotation board illumination are connected in sections to a panel in the trading room space and are remotely controlled from the floor.

Quotation Boards

As the cynosure of all eyes is the quotation boards, special study was made of these. Duplicate quotation boards, 92 ft. long and 8 ft. high, with markers' galleries mounted 9 ft. above the floor, are provided on the north and south sides of the room.

For architectural reasons it was essential that the trough for the lighting equipment project as little as possible from the face of the quotation board. From the illumination standpoint it was essential that the board be illuminated as evenly as possible from top to bottom from concealed sources with no spotiness and a sharp cut-off at the base of the board. The accompanying drawing shows the intensities on the vertical board and the intensities on the floor of the markers' gallery. Note that the maximum variation on the board is 2.5 to 1, which is practically unnoticed by the eye.

The horizontal intensity on the markers' gallery decreases from 130 foot-candles 3½ ft. from the base of the board to 17.2 foot-candles 2 ft. farther out. This sharp cut-off prevents excessive radiant heat on the markers and spill light on the trading floor. The specially designed lighting trough projects only 24 in. from the face of the board with lamp centers 20 in. from the board. Special chromium reflectors project the light from 150-watt lamps on 8½-in. centers through Holophane condenser lenses. The prismatic construction of the lens and its relation to the lamp is such that extremely accurate light control is obtained.

Time System

The entire operation of the Stock Exchange depends upon accurate, synchronized clocks, time stamps, and the opening and closing gong. It was essential that clocks be installed with second, minute and hour hands and that the movement of the hands be continuous. In an active market the last few seconds may be very important. Time stamps operate on 110-volt, d.c. impulses received every six seconds from the storage battery, thus assuring a

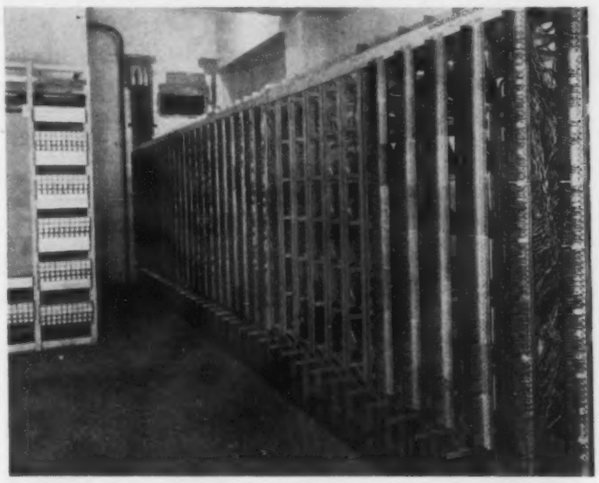
maximum possible variation between clock and stamps of six seconds. Normally the stamping mechanism is operated by direct current from the power company's source. In the event of failure of this source the circuits supplying the important Stock Exchange stamps are transferred automatically to the storage battery source.

To fill the accurate requirements Telechron clocks were used, having synchronous motors operated at 110 volts 60 cycles from the power company's regulated source. Inasmuch as accurate and dependable time is of such vital concern to the Stock Exchange is was necessary to provide means to operate the system irrespective of power conditions. This is accomplished by means of a 110-volt storage battery from which is operated a motor-generator set which generates emergency power at 110 volts 60 cycles. Exact frequency is maintained by a chronometer operating in conjunction with a Telechron motor. If this Telechron motor gets out of step with the chronometer a relay is actuated which regulates the field of the d.c. motor driving the alternator, and maintains an exact 60-cycle frequency.

Two clocks are provided in the trading room, one above each quotation board, where the exact time may be instantly observed. These clocks are 5 ft. in diameter with bronze Arabic numerals and minute markers fastened to skeleton rings, bronze hour and minute hands, and a red second hand of the full diameter of the minute circle. Flush type Telechron clocks are used in the various departments and desk clocks on the executives' desks, all synchronized with those on the trading floor.

Annunciator System

To facilitate signals from a broker's booth to the member on the floor, or from the member to his booth and elsewhere throughout the Exchange, a complete system of Lake annunciators has been provided.



The vertical side of the main distributing frame, 27 ft. long and 12 ft. high, located in the special telephone equipment room. With a capacity for the termination of 10,908 pairs of wires on the vertical side, it is slightly larger than would be necessary for a city of 10,000 population

Each booth has a 10-light built-in annunciator with individually reset relays. The various lights are illuminated from push buttons at the four trading positions, the tube centers, members' lounge and the comparison room. Each trading position has three 80-button flush bronze button boards connected in parallel to the booth annunciators and so placed as to be immediately available to any member trading at that post, or to the specialists. Each tube center has a 25-button board to signal the booths in the quadrant nearest the particular tube center.

Each broker's annunciator has a switch which illuminates the duplicate annunciators under the markers' galleries and the lounge annunciator to signal a member on the floor or in the lounge.

The annunciators are operated at 16 volts from a transformer in the basement. Each annunciator and push-button board has an individual lead-encased cable leading to one of four cross-connected terminals placed in the basement at the corners of the trading area. These terminals are cross-connected with additional cables. Thus new annunciators may be added or the present annunciators or button boards disconnected without disturbing the remainder of the system.

Public Address System

For the purpose of making announcements, and for addressing the members, an a.c. public address system has been provided. Two horns are concealed in the south wall above the quotation board, one on either side of the large clock. The microphone is arranged to be used at the floor manager's desk, in the work space on the level of the trading floor, or from the visitors' gallery.

Telephone System

Without doubt, the telephone system in the Stock Exchange is the busiest single telephone spot in San Francisco, requiring a section of one of the largest cables in the world from the central offices at 430 Bush St. Facilities are large enough to handle 1,800 calls at one time, and The Pacific Telephone and Telegraph Company estimates that the calls from the floor to members' offices will total more than 5,000 an hour, or nearly as many as the whole city pours through the busiest central office in San Francisco.

This is the first installation of an 1,818-pair telephone cable in San Francisco. The present main terminal frame accommodates the 1,818-pair incoming cable, one 1,818-pair riser cable, four 1,212-pair riser cables, and four 606-pair riser cables to sub-terminals, as well as a number of ties from the main frame to the intermediate relay racks. The private branch exchange is a two-position dial system installation having a capacity of 2,150 calls per day. This serves the 200 instruments in the office building and connects with the brokers' turret boards.

From his booth on the Exchange floor the broker may communicate directly with any other broker's booth on the floor, with his own outside office, or, through the private switchboard of the Stock Exchange he may call the telephone company's central office for outside numbers. This type of turret board was designed and first used in San Francisco. Raceways are provided in the floor and walls of the trading room for the large number of cables involved.

J. R. Miller and T. L. Pflueger were the architects, Lindgren and Swinerton the general contractors, and H. S. Tittle Company the electrical contractor.

In carload lots lumber is carried half a mile across this Sierra canyon, nearly a quarter of a mile above the bed of the river beneath. Here the receiving terminal may be seen in the left foreground and close observation will reveal a loaded carrier down in midspan

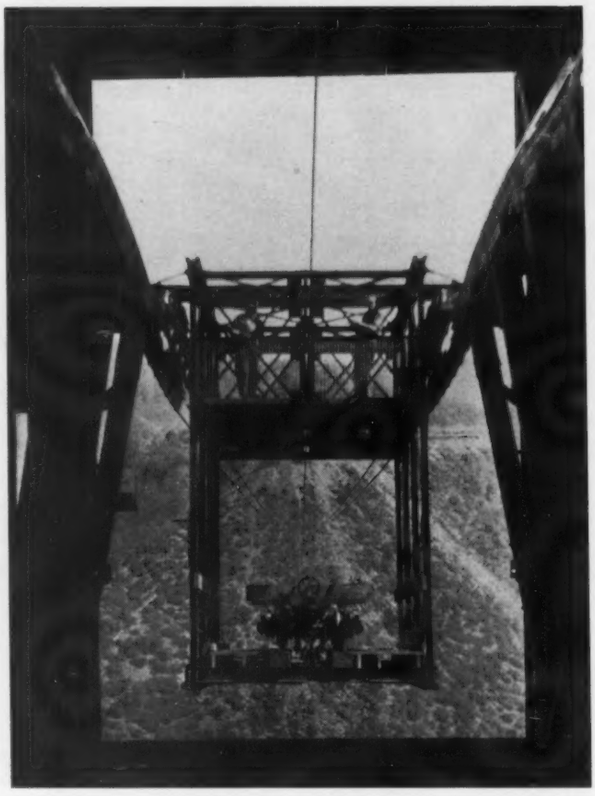
Aerial Ferry *for Logging Trains*

Electrically Operated Ropeway Speeds Delivery of Logs to Sawmill and Cuts Operating Costs

SPANNING the American River Canyon 1,200 ft. above its bed at Camino, east of Placerville in El Dorado County, Calif., is an electrically operated aerial tramway which transfers lumber in carload lots from the north to the south sides of the canyon. This aerial tramline is an important link in the transportation chain over which lumber is moved from the mountain sawmills of the Michigan-California Lumber Company to the planing mill at the broad-gage railhead at Camino. The 450-hp. electric-motor-driven equipment was placed in operation early in 1929, replacing steam-driven equipment that had been in operation since 1901.

The installation is technically classed as a single reversible ropeway—single since only one carrier is employed and reversible since the carrier is required to move across the 2,600-ft. span first in one direction and then in the other. Gross weight of the fully loaded tram carrier is 29 tons, 12 tons of which represent the loaded narrow-gage railroad car which it is designed to carry. At a normal speed of approximately 1,800 ft. per min. the equipment is designed to complete 70 round trips in an eight-hour shift. At this rate the loaded carrier makes the 2,600-ft. trip across the canyon in about 1 min. 45 sec.

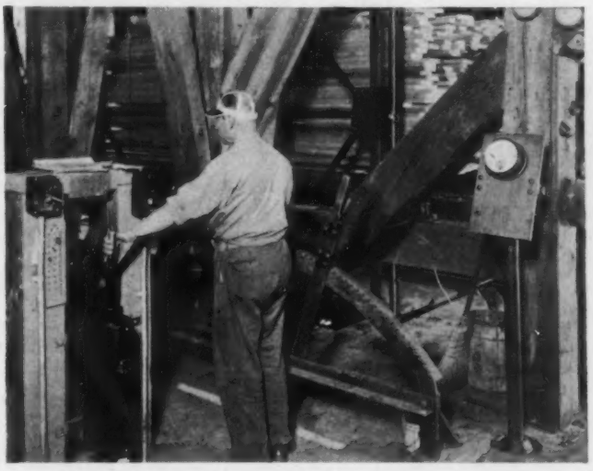
Electrical equipment driving and controlling the ropeway is installed at the discharge terminal. There, each of the two 225-hp. wound-rotor, 2,200-volt, three-phase, 60-cycle induction motors is connected through a reducing gearing to a grip sheave 96 in. in diameter. The endless driving cable which pulls the carrier back and forth across the canyon passes around a firmly anchored sheave at the loading terminal and around the two 96-in. driving sheaves at the discharge terminal.



Ropeway carrier entering the receiving terminal with an empty lumber car. Note the two men on the "upper deck"

Two sheaves were necessary to provide sufficient contact surface on the traction cable to supply the required pulling effort. Because of this it was deemed most expedient to provide duplicate motors and to operate them electrically in parallel as a single unit. The necessary idler sheaves at the south terminal are arranged to provide a maximum contact with the driving sheaves and to guide the driving cable into the necessary position.

Operating conditions required that certain special features be incorporated into the electrical control equipment and hence these are touched upon briefly. A double-drum type of geared limit switch is provided to bring the driving motors to a standstill automatically as the carrier approaches either terminal. Motors thus are brought to a standstill in four graded steps—three slow-down steps and one final stopping step, at which time the solenoid brakes are set automatically. Since it was not feasible to attempt to adjust the operation of the geared limit switch closely enough to permit accurate "spotting" of the carrier at its final position at either terminal, the control equipment provides a means of "inching" the motors to accomplish this.



Operator at the master control station in the receiving terminal ready to send a loaded carrier on its way. Mechanical brake lever may be seen at the left

This inching control circuit is carried across the canyon on a pole line so that the operator at either terminal may bring the carrier to the desired position at his terminal. Through an interlocking system the control of the driving motors is taken away from the main operator at the discharge terminal as long as the operator at the loading terminal is using the inching control. Control of the carrier is retained at the loading terminal by the loading operator until the carrier is loaded and ready for its return trip. Then by means of a push-button switch control is transferred to the discharge operator.

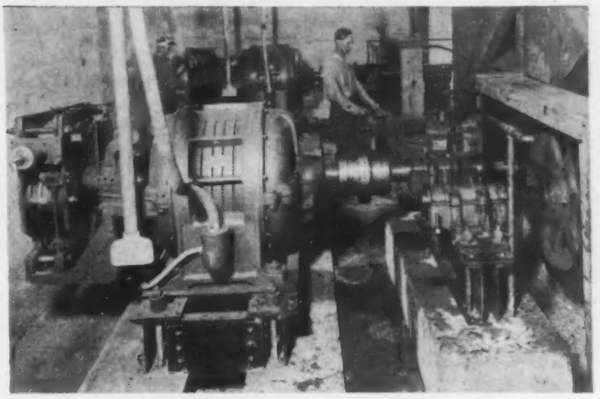
As the loaded carrier approaches the discharge terminal and makes contact with the landing rail it does so at an angle of about 20 deg. from the horizontal. To move the loaded carrier up this steep grade during the inching process requires a high torque delivery from the motors. Consequently it was found necessary to adjust the secondary resistance connection during the inching operation so that the motors deliver very nearly their maximum torque output. Momentarily the two motors are capable of exerting a combined effort of 800 hp.

With the carrier at either terminal, starting and acceleration are accomplished by means of manual manipulation of the master controller at the discharge terminal. Once started and brought up to speed the electrical equipment normally requires no further manual operation, since the limit switch will take care of the stopping automatically. However, it is usual practice for the operator to utilize the mechanical brake to secure a smooth and gradual slow-down to a stop.

As loaded carriers descend into the sag of the cable, which amounts to about 125-ft. vertical distance, there is at times an "overhauling" effect which tends to accelerate the driving motors above their normal speed. Should this tendency occur at a time when the motor secondaries are operating with resistance in their circuits, dangerous overspeeds might result. To obviate this possibility the master controller is so constructed that it is not possible for the operator to leave the handle on any intermediate position.

Four 2-in. locked-coil steel cables provide the track on which run the 32 30-in. wheels of the carrier. At the loading terminal the four track-cables are anchored rigidly to a 350-ton concrete block while at the discharge terminal constant tension in the track-cables is maintained under varying temperature and operating conditions by passing the track-cables over 5-ft. sheaves and attaching to each cable a 60-ton counter weight.

Electric power for this installation is supplied by the Pacific Gas and Electric Company through a special substation tapped directly on a near-by 60-kv. transmission line. This service provides the unvarying voltage condition required for the installation to assure that the motors can develop their maximum starting and running torques as required. Mechanical equipment utilized in the installation was designed, manufactured and installed under the direction of the U. S. Steel Products Company. Electrical apparatus was selected, manufactured and installed under the direction of the General Electric engineers.



Two 225-hp. G.E. induction motors, capable of a momentary effort totaling 800 hp., serve the Camino (Calif.) ropeway of the Michigan-California Lumber Company. Solenoid brakes may be seen at the left

Automatizing HIGH VOLTAGE Transmission

By C. E. BAUGH[1] AND P. B. GARRETT[2]

IN PIONEERING the field of high-voltage transmission of electrical energy, the West has added another chapter to its history. Complete automatic and unattended operation of a high-tension transmission substation and switching station, together with the automatic synchronizing of high-voltage lines and reclosing of high-voltage oil circuit breakers, now is an actuality at the Morgan Hill substation of the Pacific Gas and Electric Company.

Morgan Hill substation, completed and placed in operation in February, 1929, is approximately 70 miles south of San Francisco and forms a new tie between the company's 100-kv. and 60-kv. systems. This station constitutes a major source of supply to the company's 60-kv. system in Santa Clara and San Benito Counties and to the 60-kv. system of the Coast Counties Gas and Electric Company.

Two 100-kv. transmission lines feed into the substation from Newark substation, 33 miles distant and about 30 miles south of Oakland on the east shore of San Francisco Bay. The latter station is the most southerly of the two principal switching centers for the high-voltage transmission system of the company. One of the 100-kv. lines continues south from Morgan Hill to Salinas and 60-kv. lines feed south to Salinas and north to a tie with the 100-kv. system transmitting power to San Francisco from the Stanislaus and Melones hydroelectric plants on the Stanislaus River. Energy also is supplied at 60 kv. to the Coast Counties Gas and Electric Company's substation which is on property adjoining the Pacific Gas and Electric Company's substation property at Morgan Hill.

Transformers as installed consist of a bank of three 10,000-kva. units, 100-kv. grounded star to 60-kv. grounded star to 11-kv. delta. A spare transformer is arranged so that it may be cut into service on any phase. Transformers are self-cooled up to 7,000-kva. rating. Cooling for an additional 3,000 kva. is obtained by blowers attached to the radiators, which are cut into operation automatically by thermostats on each transformer.

Because of the comparatively simple switching arrangement and the small number of switching operations required, it was decided that manual operation would not be necessary or economical. However, it was found desirable to provide for maximum continuity of service, primarily because of the delivery of energy at this point to the Coast Counties Gas and Electric Company. This continuity could be insured only by operating the two 100-kv. lines and the two 60-kv. lines in parallel at all times and by providing relays that would isolate a faulty line from the station without affecting the remaining lines. With these conditions in mind it appeared that an attempt should be made to simulate, as closely as possible with the automatic devices available, the operations that would take place at the station if continual manual attendance were provided. This involves the immediate reclosing of any high-voltage breaker that opens automatically, assuming that certain preconceived electrical conditions obtain in the station and on the line or lines involved.

Operating conditions set up for the station are as follows:

1. If a 100-kv. breaker trips out due to line trouble it shall be reclosed as soon as normal potential in synchronism with the station potential is returned to the line, the burden of testing the line being placed upon a manually operated station.

2. If a 60-kv. breaker trips out due to line trouble, the other stations on that line shall stay off the line until Morgan Hill has reclosed the breaker automatically to test the line, after which the other stations will check synchronism and reclose.

3. If, during any general system disturbance, power fails on all of the 100-kv. and 60-kv. lines, thus leaving the station without potential, all of the 60- and 100-kv. line breakers shall be opened, leaving the lines clear of the Morgan Hill load while service is being re-established from other manually operated stations. As soon as

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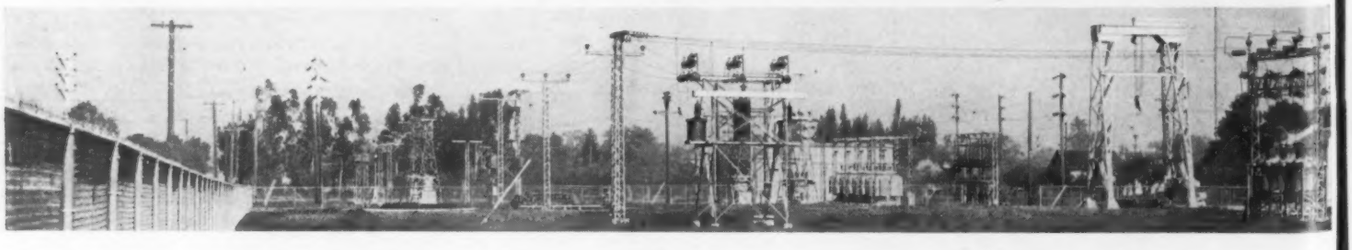
[2] Engineering supervisor, Westinghouse Electric & Manufacturing Company, San Fhancisco.



service is re-established on one of the 100-kv. lines, the breaker on that line shall be reclosed to energize the station. When service is re-established on the second 100-kv. line at the same time or later, it shall reclose in the normal manner. After the station has been energized, the 60-kv. breakers shall reclose in the normal manner.

4. No 100-kv. breaker shall reclose more than once within a period of two minutes and the 60-kv. breaker shall not reclose more than once within a period of one minute.

5. If any breaker trips out due to station overload, transformer over-temperature, or internal transformer faults, it shall be locked out until manual attention has been provided.

A description of the manner in which the foregoing requirements were met follows. The first requirement, namely, the reclosing of either 100-kv. breaker upon return of potential in synchronism with the station potential to the line involved, necessitates the use of an automatic synchronizing device* which (1) will check synchronism on the two sides of the breaker; (2) which will not permit the breaker to close unless there is less than a predetermined voltage difference and frequency difference between the two potentials; and (3) which will close the breaker only when the phase angle between the two potentials is within good synchronizing limits. Of primary importance in the selection of a device to perform this function is the requirement that it never shall reclose the breaker when conditions are wrong rather than that it always shall reclose the breaker when conditions are right. As a matter of fact, however, it has been found that the automatic synchronizing device is more dependable and more accurate than manual synchronizing under both of these conditions.

Switching at Morgan Hill substation involves the checking of synchronism between the 60-kv. and the 100-kv. systems, which may be entirely separated at all points. Also synchronism must be checked between the two 100-kv. lines, which may be energized from two different 100-kv. buses at Newark substation, or, one 100-kv. line might be energized from the bus at Newark substation and the other line from the bus at Salinas substation. Breakers at Morgan Hill might be the initial tie between two independent generating systems, in case of an extensive disturbance, or they might constitute a tie between two systems which already are tied together at some other point.

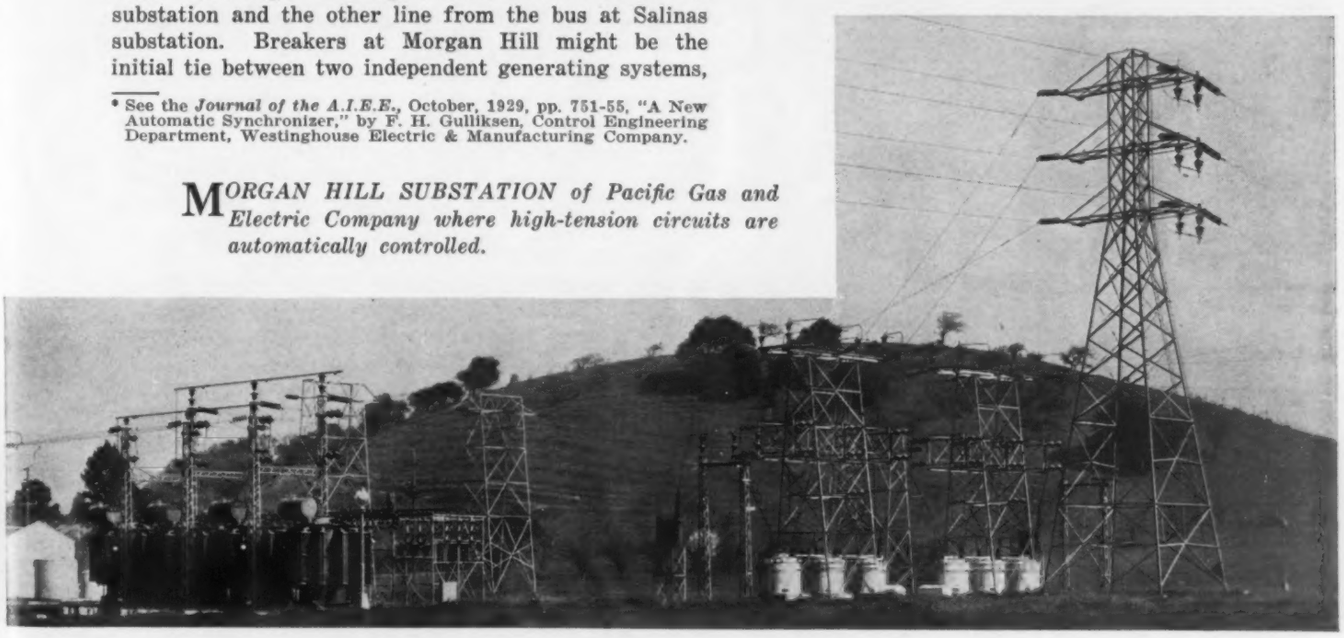
While automatic synchronizers have been applied to automatic power houses for synchronizing a generator to an energized line, this installation at Morgan Hill is one of the first in which similar equipment has been installed in a substation to synchronize between two energized 100-kv. sources. Conditions in the two cases are decidedly different, inasmuch as there is no control over the voltage or frequency at the substation, and the breaker to be closed might be either the first or the last tie between the two systems.

Just as in the case of paralleling two generators, three fundamental conditions must exist when tying transmission systems together, if the requirement of zero equalizing current between sources is to be met: (1) Voltages of the two sources must be equal, (2) phase displacement between the voltages must be zero, and (3) frequency difference between the two systems to be connected must be zero. One of the duties of the automatic synchronizers at this substation is to permit the 100-kv. breakers to close, with power available on both sides of the breakers, when the three conditions just outlined obtain at the instant the breaker contacts engage.

Ideal requirements seldom are met with in actual operating practice and slight deviations from perfect synchronizing conditions are permitted in the interest of speed of operation. In the majority of practical applications zero-frequency difference cannot be obtained within a reasonable time. Fortunately, exact zero-frequency difference is not necessary in actual operating practice.

Zero voltage phase displacement, at the time of engaging the breaker contacts, however, is a requirement which must be met. The idea underlying the design of an automatic synchronizer, therefore, is to provide an apparatus that will close the breaker connecting two sources to be synchronized if the frequency difference between the two sources is less than a predetermined

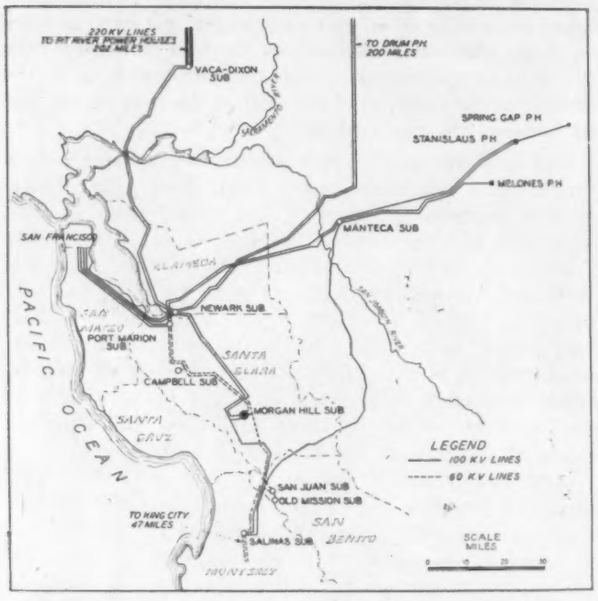
* See the *Journal of the A.I.E.E.*, October, 1929, pp. 751-55, "A New Automatic Synchronizer," by F. H. Gulliksen, Control Engineering Department, Westinghouse Electric & Manufacturing Company.



MORGAN HILL SUBSTATION of Pacific Gas and Electric Company where high-tension circuits are automatically controlled.

value to be chosen for each particular application. Further, the equipment must close the breaker at such a moment that, independent of the instantaneous frequency difference, the breaker contacts will engage always at the moment of zero phase displacement between the voltages, or at synchronism.

One of the major factors which complicates the design



Skeleton map of part of Pacific Gas and Electric Company's transmission system, showing important tie point at Morgan Hill Substation

of an ideal automatic synchronizer is the time element of the circuit breaker itself. A certain time is always required after the energizing of the closing coil of a circuit breaker before the breaker contacts actually close. This time is practically constant for a given breaker. Therefore, the synchronizer must energize the breaker closing relay in advance of zero phase displacement. The amount of advance must automatically be proportional to the instantaneous frequency difference.

Adjustment of the automatic synchronizers is comparatively simple. Such apparatus is calibrated and tested in the factory under true operating conditions. Field changes necessary are the adjustment of the amount of advance to suit the particular breakers applied and the adjustment of the lock-out for frequency difference.

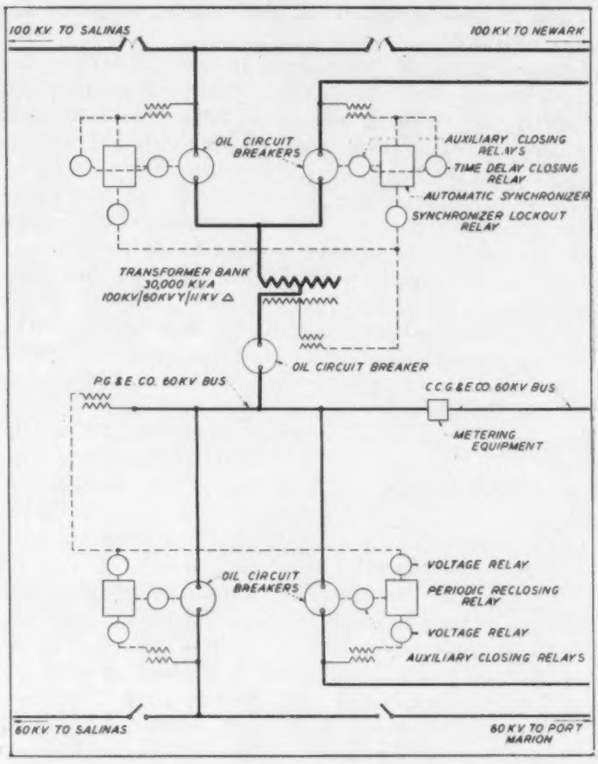
Automatic synchronizers are designed to operate on potential transformers with 110 volts secondary voltage. Average load on each potential transformer is 40 volt-amperes. Taps are supplied on the resistors in the control circuit of the apparatus so that connections can be made to 48-volt or 125-volt d.c. control sources. For 250-volt d.c. control voltage an external resistor is supplied. A control voltage of 125 volts is utilized in the Morgan Hill substation. Back contacts of the circuit breakers are connected in series with the d.c. control circuit so that the telephone relays of the synchronizers are de-energized when the breakers are closed.

Synchronizers will energize the breakers at a maximum advance of 35 electrical degrees. To obtain proper performance of the synchronizers the maximum frequency difference for which the synchronizers are adjusted to operate to close the breaker is given by the equation

$$F = \frac{35}{360\ T}$$

where T represents breaker-closing time in seconds and F, of course, represents the frequency difference in cycles per second. For operating reasons the lock-out frequency difference is kept well within this limit.

Quite often the synchronizers are called upon to close the 100-kv. breakers when the two sources already are in synchronism through some other tie in the system.



Schematic diagram of Morgan Hill circuits and switching equipment

In such a case the synchronizing contacts of the automatic synchronizing relays are held in contact continuously and reclosure of the breakers takes place through the contacts of a definite-time-delay relay built into the synchronizer.

A voltage relay energized from the potential transformer supplying synchronizing potential on the station side of the breakers to guard against false operation in case of a blown primary fuse, locks out the synchronizer in case there is no potential on the station bus. This arrangement is necessary because the synchronizer is unable to distinguish between conditions of exact synchronism and no potential. A frequency relay locks out the synchronizer unless the station frequency is at least 55 cycles. (Normal frequency on the Pacific Gas and Electric system is 60 cycles.)

Auxiliary relays are inserted to prevent the synchronizer from reclosing the breaker a second time in case the breaker does not stay closed for at least 10 minutes following an automatic operation. This pre-

caution is necessary in case either of the two phases not supplying synchronizing potential should be grounded on the Morgan Hill side of a break in the transmission line while remaining clear on the other side. Under these conditions the line could be energized from the other end and the Morgan Hill breaker could close into a fault indefinitely.

Reclosing of the 60-kv. lines is accomplished by standard periodic reclosing relays which are cut into operation only when there is potential on the station bus and no potential on the lines. The number of reclosures may be varied from one to three at easily adjustable time intervals.

In case of failure of potential on the station bus, two voltage relays connected to two separate potential transformers operate to trip all breakers connected to the station bus, and to lock out the automatic synchronizers. Contacts are so wired that both of these relays must be de-energized before the breakers can be tripped or the synchronizers locked out. Two relays were used to guard against the blowing of any one primary fuse, which otherwise would give an indication of no station voltage. These same two voltage relays also cut in two long-time-delay voltage relays with their potential coils connected to the 100-kv. line potential transformers. The energizing of either line starts the relay disk and the contacts carried by the disk energize a breaker closing relay after a suitable time interval. Similar provision against closing into a fault is made as for the automatic synchronizers.

Overload relays trip out the 60-kv. "total" breaker, which can be reclosed only manually and after the source of the trouble has been located. Differential relays connected to the various transformer windings and transformer over-temperature relays, trip the two 100-kv. breakers and the 60-kv. total breaker and lock out all reclosing devices until manual attention has been provided and the cause of the trouble remedied.

Transfer switches for each circuit place the circuit under either "hand" or "automatic" control. When the switch is in the "hand" position the breaker cannot be closed automatically, neither can it be closed or opened by hand when it is in the "automatic" position.

Before this station was placed in service, exhaustive tests were conducted to determine the adequacy of the automatic synchronizing, controlling and protective equipment. Special switching arrangements were made on the system, such that one unit at Drum power house together with approximately 200 miles of 100-kv. transmission line feeding into Morgan Hill substation were cut loose from the rest of the system during the period of the tests. Thus there was made available a power source that could be adjusted to various frequencies and voltages which were matched against the system frequency and voltage.

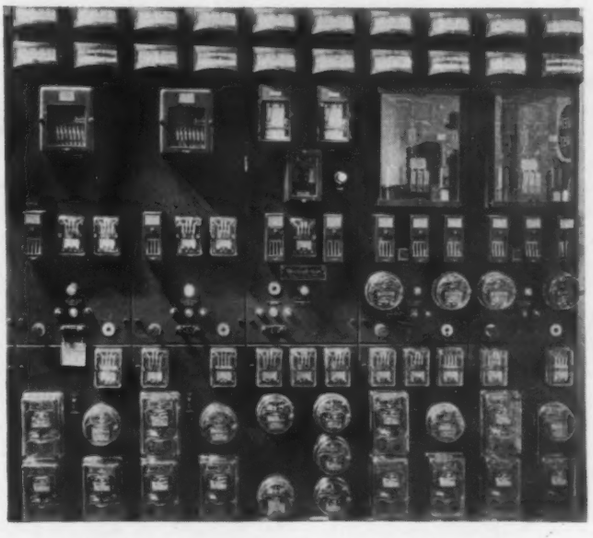
Prior to their installation, the automatic synchronizers were adjusted for equal voltages on the two sources to be synchronized. The maximum difference of potential which might be obtained at Morgan Hill was unknown and consequently there was particular interest in determining the results which might be expected with an appreciable voltage difference. It was expected that a readjustment of the synchronizers, to compensate for the voltage difference as determined by test, would be necessary. However, such did not prove to be the case.

The voltage on the incoming line from Drum power house, which was segregated from the rest of the system, was boosted by steps to a maximum of 135 kv., or 35 per cent above the voltage of the substation bus. Even under this condition, which was a greater voltage difference than would be expected under any operating condition, the synchronizers operated to close the breakers well within "five minutes to twelve o'clock" on the synchroscope. As expected, the point of closing of the breaker varied from the point of exact synchronism, as indicated by the synchroscope, by approximately one-half degree per volt difference in (secondary) potential of the two sources being synchronized. It may be interesting to note that 140 kv. was found to be approximately the limiting voltage. That is, any greater voltage difference would not permit the synchronizers to go through the operations required to make all of the contacts necessary to a proper set-up for synchronizing.

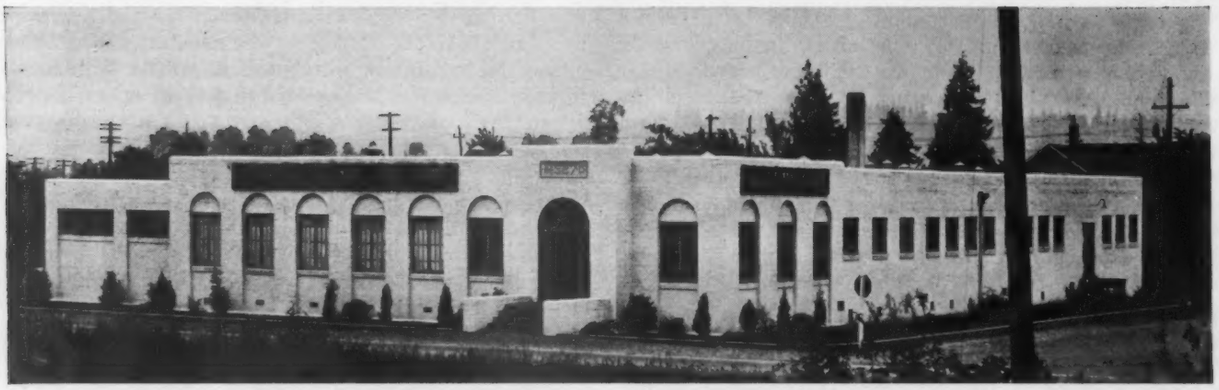
Lock-out frequency difference was set for one-half cycle. This value was obtained by substituting in the previously mentioned formula a breaker closing time of one-fifth of a second, as furnished by the manufacturer.

Experience with the Mogan Hill installation over a year of service has demonstrated its ability to function promptly and properly under all operating conditions. By reason of the accuracy with which synchronizing is accomplished automatically and because of the reduced disturbances and lower transmission line surges than could be obtained with manual operation, the automatic synchronizing equipment has proved its worth, even were attendance available.

Substitution of mechanical devices for the human element in the operation of this station has resulted in material savings in operating costs at a very small increase in capital costs. Furthermore, it has eliminated nerves and human emotions, the absence of which enables the mechanical devices to function at all times at the maximum of efficiency. Periodic inspection and maintenance are given the entire equipment in line with customary practice in similar automatic switching applications.



Switchboard equipment for automatic synchronizing; two 60-kv. panels at left, transformer panel at center, two 100-kv. panels at right. Automatic synchronizers near top of two 100-kv. panels.



Kent Hatchery in Washington produced 800,000 chicks in 1929

Electricity Replaces Kerosene in Large Hatchery

ONE of the largest commercial hatcheries in western Washington, the Kent Hatchery, producing "Skookum Chix," has been experimenting in recent years with both electricity and oil as heating agents for its incubators and brooders. When the business was started in a small way sixteen years ago, oil was used exclusively for furnishing the heat for incubation. In recent years, with the development of electrically heated incubators and brooders, a gradual replacement of oil burning equipment with electrically heated equipment has been going forward until at the present time all of the brooding equipment and about one-third of the incubators in the plant are electrified.

E. W. Engstrom, owner of the business, reports that the hatchery has made large savings in labor through the use of electricity and, because of the better heat control possible with electrically heated equipment, has secured more uniform hatches. He states that the problem of financing the electric equipment, involving as it does the scrapping of still useful oil burning equipment, has been the only deterrent to a complete change.

The principal production problems of the business revolve around temperature and ventilation, and in controlling these elements electricity has been found particularly applicable. The business involves the receipt of eggs which must be kept at 55 deg. F. until they are ready to be put into the incubators; the incubation of the eggs, which requires a constant temperature of 100 deg.; the sorting and shipping of such chicks as can be shipped immediately on coming out of the brooder, which must be done in a room maintained at 70 deg.; and the "starting" of those chicks that cannot be shipped immediately, which is accomplished in brooders. Each of these processes is carried on in a separate room, and in all cases the heating and ventilating problems involved have been capable of solution through the application of electricity to heating, cooling agencies, and fans.

In the egg storage room the principal application of electricity is for a fan on the humidifier, which keeps the room at 55 deg. even on the hottest days. The incubator room contains 15 model No. 46 Buckeye Mamouth incubators, each having a capacity of 16,128 eggs, and five smaller machines of 15,000-egg capacity, giving the plant a total capacity of 316,920 eggs at one incubation. Out of the twenty machines at present installed, fourteen are oil burning, two are combination electric or oil, and four are straight electric. Each electric machine has three 800-watt heating units, or 2.4 kw., and all have three electric fans rated at 255 watts in fan motors per machine.

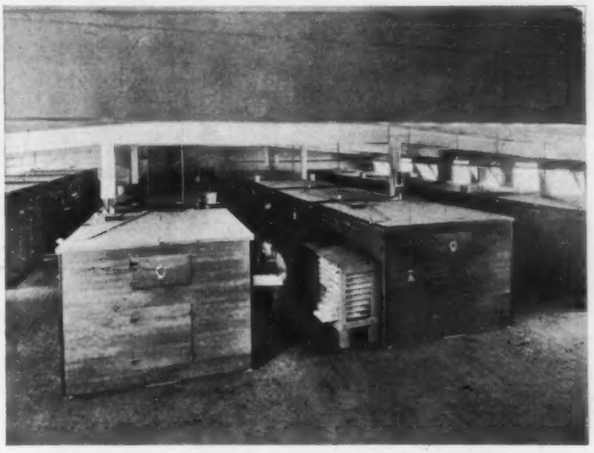
The machines are not loaded to capacity at one time. One-fourth of the total capacity is loaded about every seven or eight days, so that after a month's operation in the hatching season the plant is producing about 80,000 chicks a week. The temperature of the brooder is controlled thermostatically, and when the machines are full

of eggs the electric machines consume an average of 10 kw.-hr. per 24 hours, while the oil machines consume about 3 to 3½ gal. of kerosene in the same period.

As soon as the chicks come out of the incubators they are taken to the sorting room, which is kept at 70 deg. thermostatically through the operation of the building's oil-burning heating system. Here they are placed in pasteboard chick boxes for shipment. Immediately adjacent to this room is an inclosed driveway, likewise kept at 70 deg., where the company's trucks are loaded with the chick boxes, some for truck delivery to points within

Sorting room where chicks are prepared for shipment

a 100-mile radius of Kent, and some for rail shipment to points as far distant as Montana, Wyoming and Colorado. Shipments are timed to reach their destination just in time for the first feeding. Proper ventilation is necessary in the sorting and shipping room and in the



Battery of 20 incubators with total capacity of 312,000 eggs

loading room, and is accomplished by the use of electric fans.

For such chicks as cannot be shipped immediately there is a brooder room where the chicks are "started," or in other words kept in brooders during the early part of their lives. They may stay here for a period of from a few days to two weeks. It is said that the best seller is the day-old chick and that the next best is the week-old chick, some poultrymen preferring the latter, believing that the chicks thus "started" are beyond the danger point and are easier to raise. This brooder room contains fifteen Buckeye multi-unit brooders of six tiers each, with a total load of 1,600 watts and a capacity of 1,000 chicks per brooder. Each brooder has thermostatic heat control. Here again ventilation plays a most important part and the process of working this out has

Brooder room containing fifteen 1,600-watt electric brooders

involved trying out different combinations of exhaust and circulating fans. At present six fans totaling about 1 hp. of load are used.

No data on the comparative costs of oil and electric operation are available, as the accounting and cost keeping systems employed at the plant do not reveal these relative figures. On this score there is only the word of Mr. Engstrom and his manager, R. E. Waldo, who supplied much of the information contained in this article, that the introduction of electricity as a heating agent into the plant's operations has effected economies and has produced a better product and cut down losses. That the business has progressed successfully, and that it seems to offer unusual opportunity for continued expansion, because of the increasing importance and size of the poultry industry in western Washington, is indicated by the fact that the output of the hatchery in 1924 was only slightly more than 100,000 chicks, while in 1929 it was over 800,000. A production of over a million chicks is planned for 1930. Other and smaller hatcheries are operated by the company at Great Falls and Helena, Mont.

It is interesting to note that were the present Kent Hatchery fully electrified it would have a connected load of 72 kw. in heat and about 10 hp. in motors. The present connected load is 14.4 kw. in incubators, 24 kw. in brooders and 10 hp. in fan motors. Although accurate data are lacking, the diversity in the heating equipment is known to be high, as is the load factor during the hatching season. Further, with such a large percentage of the load in unity power factor equipment, the over-all power factor of the plant is relatively high.

Electrical West

G. C. Tenney, *Editor*

Farm Electrification Problem From Two Different Viewpoints

PRINTING in this issue of a description of a rural line built of 2 x 6's spiked to railroad ties by the Portland Electric Power Company near Salem, Ore., calls to mind some thoughts on rural electrification. Two schools that look toward a solution of the farm electrification problem seem to have developed. One holds that construction standards are too high and lines consequently are too costly. The other holds that it is not possible to reduce the cost of rural construction by attempting off-standard design without weakening the physical property and paving the way for excessive maintenance costs in the future. Those who hold this opinion insist that if a solution of the farm electrification problem is possible, it lies not in reducing investment but in increasing the farm load.

Undoubtedly there is a place for both schools. Electrical West is not ready to agree that a cheaper rural line can be built only by the sacrifice of sound building principles. Previously described experiences with off-standard rural lines, such as the X-frame construction of the Young Electric Company and the light fir pole line bolted to 8 x 8 creosoted stubs as used in some cases by The California Oregon Power Company, indicate that the builders of these lines have met with no unusual trouble and do not expect any. These lines are all several hundred dollars per mile cheaper than the types of line considered standard. They undoubtedly have a definite function as branch lines in territory where prospective business is thin. Many of them have been built under pressure from the farmers in instances where standard construction would have demanded a prohibitive advance payment from the prospective customers.

In many cases, however, such lines can not be built because of the nature of the present and expected business to be served and other economic elements involved. In such instances the commercial school of thought has predominated and the companies have made every effort to find applications for the farmer to use with profit to himself, so that he could afford to pay a revenue for which the companies could afford to build standard lines.

As a matter of fact, disregarding isolated cases and viewing the problem of farm electrification as a whole, it seems unequivocally true that the solution lies in increasing the load rather than in lowering the investment. The tendency among those companies that have really taken the rural electrification problem seriously has been to consider it as a commercial and economic problem involving business development, rather than as an engineering problem involving design and construction.

The Whole—or the Sum of Its Parts?

ANYTHING, from a dinner to a dowry, is a rather unsatisfactory affair if it is acquired piecemeal. Imagine the state of digestion of a person fed a mouthful of something, then made to wait days before another could be taken.

The appliance purchaser has been placed in that uncomfortable and unsatisfactory situation. Electricity, she is told, is a wonderful thing. It can do wonders to relieve drudgery and bring comfort. And yet she must acquire this comfort a bit at a time. She must relieve drudgery in one quarter of her household while yet she continues to slave in another. The net result is a displeased attitude toward the entire electrical business.

Obstacles to buying, the electrical industry has fondly believed in the past, have consisted of two or three things—rates, wiring inadequacy, cost of appliances, and finally it was admitted that perhaps consumer acceptance might not be ripe. Yet just what it was that retarded the ripening of public acceptance was not often considered.

Is it not safe to assume that one of the most potent factors for dissatisfaction with electricity is the fact that very few people know what it will do? It may be said that many know what a toaster will do. Others know what a waffle iron will do. A few more know the virtues of an electric range. More are learning the joy of an electric refrigerator. Yet how many are wholly convinced that all labor and mechanism in their homes, all heating, all lighting, should be electrical because it is the best, the modern, the ideal way to do it? And why are there not more who feel that way about electricity?

The answer is that the public has been fed electricity piecemeal. It has been given a dab here and

a dab there. The fortunate few who can boast of having a complete electric home are so rare that their influence as yet is negligible.

Now for the first time appears a plan whereby the prospective purchaser of electrical appliances may be sold the entire list of necessities which will make electricity mean complete satisfaction to her. Instead of dabbling in electricity she may have a complete electrical home. She may learn to know and to appreciate it so keenly that never again will she be happy with anything less.

The complete home contract under which the home owner may purchase all of the essential electrical appliances at once and pay for them over a period of time, even as the home is paid for, is the whole that is greater than the sum of all its parts. When the electrical home equipment is purchased a part at a time, eventually, perhaps, all may be attained. But when the electrical home complete is sold at once the entire load is earning revenue for the electrical industry from the date of purchase. To the central station, certainly, this is a case of the whole being greater than the slowly accumulated sum of its parts.

An Opportunity for Modernization

MODERNIZATION is the watchword of industry in this year 1930. Never before has attention been more closely focused upon the need for improvement in plant, factory, and equipment, both as a stimulus to business and employment, and for the increased efficiencies that will result. Naturally, the electrical industry will profit from such a campaign, for modernization means a wider and better application of electric power.

To date there has been little talk of extending the campaign to the electrical industry itself. Yet even a cursory examination of power company plant and equipment points to many opportunities for modernization. Take hydro-electric plants as a single instance. Here in the West there are scores of plants installed twenty or more years ago that might be classed almost as "antiques." They are still dependable; they grind out an annual crop of kilowatt-hours; but they are costly to operate and maintain.

A campaign to modernize these plants would do two things. It would provide work, both for the manufacturers and for construction crews. It would result in economies and increased output that would more than offset the cost involved.

Much is being written and said about the increased efficiencies of modern steam plants. Yet in the case of many of the older hydro stations, particularly where impulse wheels are installed, efficiencies can be raised from 70 or 72 per cent to 85 per cent. Moreover, such plants can be changed to remote or fully automatic control with marked savings in operating expenses.

This is only one instance of the application of modernization to the power companies themselves. Many more opportunities exist. Certainly the time was never more auspicious for undertaking such a program. The entire business and industrial world is thinking in these terms. For the power companies to ignore this situation is to forfeit the leadership they hold in today's march of progress.

Answer to the Range Problem

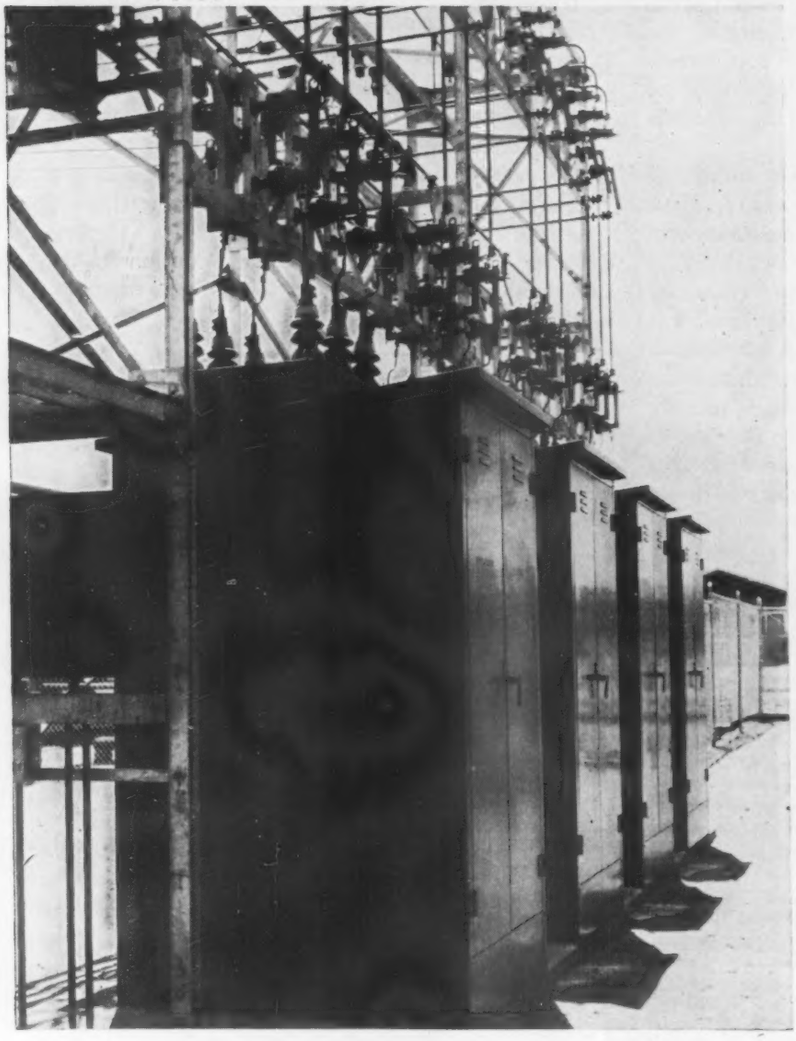
MR. CHIEF EXECUTIVE, do you still doubt that the electric range constitutes both profitable and desirable load? Mr. Sales Manager, are there points in preparing an electric range campaign that are not clear in your mind? Mr. Salesman, are there questions regarding electric cookery that you cannot answer satisfactorily? Mr. Engineer, do you want information about the technical characteristics of the rage load?

Answers to all of these questions, and many more, are to be found in "Building the Domestic Electric Range Load," a 43-page report just issued by the Electric Range Committee of the N.E.L.A. Although much has been written on the subject of electric ranges, ELECTRICAL WEST believes that no more comprehensive study of this subject has ever been made.

By enlisting the co-operation of all groups of the industry concerned with electric ranges, the committee has recorded in this new manual the guiding principles for successfully building range load. With the manual it is possible to define sales policy, set up a sales organization, judge personnel qualifications, prepare promotional features, and build a program that will produce definite results.

"Building the Domestic Electric Range Load" is commended to every branch of the industry interested in the subject. It answers every important question regarding the range business. Study and use of the range manual should build more range load.

Engineering Practice



Standardized Cabinets Permit Outdoor Use of Indoor Equipment

By FRANCIS CURTIS, Engineering Department, The Southern Sierras Power Company, Riverside, Calif.

APPRECIABLE savings in construction costs and invested capital have been realized by The Southern Sierras Power Company through the adoption of standardized outdoor switch houses designed to accommodate indoor switching and metering equipment. These switch houses have been designed by company engineers and are built in the company's shops for utilization at the many outlying and relatively small substations where the cost of a building to house indoor equipment would be prohibitive.

One standard size made up in four different types has been found to be adequate to meet operating requirements. The standard size of 3 ft. 6 in. wide, 4 ft. 6 in. deep and 7 ft. 6 in. high was adopted because it allowed sufficient space for the installation of an oil circuit breaker of ample capacity to meet the requirements that would be met wherever such a switch house might be used. The units conform in outward appearance to the standard manufactured switch house containing automatic-reclosing oil circuit breakers and related equipment, which the company is using at various substations.

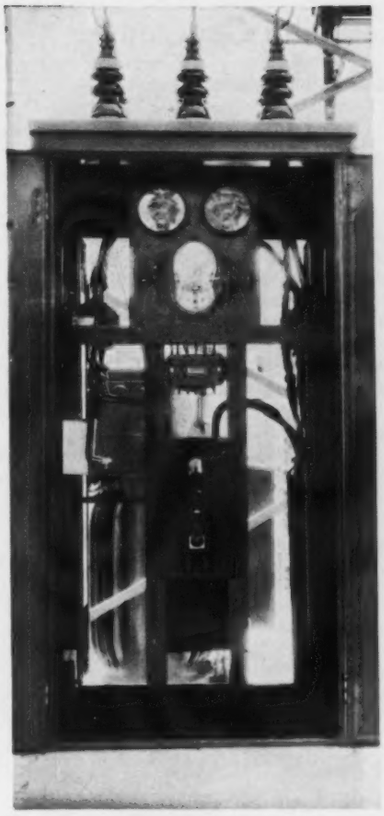
Sheet steel, No. 18 gage, is used throughout and ragidity is accomplished without the aid of stiffening channels or angle iron pieces by bending or pressing the sheet steel so as to form channels at the corners and midway in the walls. Double-hung doors are provided both at the front and rear to allow ready access to the interior and No. 20 gage shallow box stiffeners are welded to the inside of each door to serve as reinforcing members. A rotating handle provided for each pair of doors is so fitted with a linkage system and sliding rods that the doors are held tightly shut at both top and bottom. A metal trim which serves also as a casing for each pair of doors most effectively keeps out rain, even in a driving storm. Elimination of angle-iron in the construction of the body of this switch house made possible material savings in weight and cost.

Angle-iron is used for the framework within the switch house on which is mounted the oil circuit breaker and the related instrument panels. Light 1½ x 1½ x ⅛-in. angle pieces are bolted to the switch house to carry the instrument transformers.

To provide greater flexibility and still to maintain simplicity and standardization in design, four different types were decided upon, as mentioned. The difference between these types lies chiefly in whether conduit or roof bushings are made use of in gaining entrance to the switch house with electrical leads. On top of the switch house and standard with each, as far as size is concerned, is a roof hatch made up of No. 16 gage sheet steel and bolted in place by means of eight small bolts. Thus a change in roof hatch accomplishes the desired change in switch house type, the other features of which are standard.

VARNISHED CAMBRIC IN CONDUIT

In type RC switch houses connections to equipment within the house are made by means of varnished cambric leads entering the switch house through conduits terminating in the rear of the roof hatch. This type generally is adopted where the expense of the installation in question must be



Looking through one of the 2.3-kv. cabinets shown on the facing page

kept at an absolute minimum and in this the elimination of roof bushings is a contributing factor.

This arrangement is used with some of the lower capacity pipe-frame substations in the more remote areas. The outgoing conduit in this case bends 90 deg. from the hatch and rises vertically up the face of the substation structure to an elevation at which the outgoing line dead-ends. There the conduit terminates in a weatherproof outlet and connection is made to the line.

Entrance Through Roof Bushings

The arrangement used in Type "RB" incorporates 6.6-kv. weatherproof roof bushings bolted to the standardized roof hatch for the purpose of making connection with equipment inside of the housing. This type most generally is used in the medium-sized substation where the switch house is located directly beneath the 2.2-kv. buses. Thus the circuit disconnecting switches may be mounted on the bus structure directly above the switch house bushing. To obtain waterproof construction, and in addition to the cork gasket which is placed between the bushing flange and the metal hatch, a special bolt-ring casting is placed on the inside of the roof hatch. This equalizes the pressure on the gasket surface and has been found to be satisfactorily waterproof.

A modification of this same type is known as type "RBFT." In this design the incoming leads are taken through the roof, whereas the outgoing leads are taken through underground conduit. This type is less frequently used than the others and is made up primarily for special cases.

Entrance Through Underground Conduit

In the type "FC" design, underground conduit is provided for both ingress and egress of the circuits connecting with the switches and metering equipment inside of the cabinet. With this type, of course, only a blank roof hatch is used.

Standard Equipment

Equipment normally contained within the standardized switch house includes the following:

1. Oil circuit breaker
2. Tripping current transformers
3. Metering current transformers
4. Potential transformers
5. Watthour meter
6. Instrument panel.

One of the accompanying illustrations shows the interior of a typical "RB" switch house showing the relative position of equipment.

Separate current transformers are used for tripping the oil circuit breaker by means of transformer trip coils. This design is used for two reasons. First, to insure positive operation through the use of transformer trip; and second, because of inaccuracies in metering incurred when both metering and tripping circuits are supplied from one set of current transformers.

In switch houses serving 2.2-kv. lines, bus supports and removable links are installed in place of the third current transformer, which is required only in 4-kv. service. By removal of the bus supports and copper connecting links the additional current transformers may be installed if, as and when needed. The simplest of the various layouts of equipment is one where the oil circuit breaker and tripping current transformers only are included, an arrangement which serves the bare necessities of very small substations having a very low installed transformer capacity.

In addition to switch houses which are used solely for the installation of distribution feeder equipment, these same standardized houses also serve very well indeed for the installation of relays and related protective equipment. In this arrangement a larger panel is installed which allows the mounting of six sets of overload induction relays or other equipment requiring equivalent panel space. In this capacity the standardized switch house serves as adequate weather protection, obviating the necessity of a building and maintaining a uniform appearance as far as substation equipment is concerned.

In standard service the wiring within the switch house, as far as main leads are concerned, is accomplished with 5-kv. insulated varnished cambric 1/0 cable, or larger if required. All 2.2-kv. live parts are thoroughly taped and insulated to a value equivalent to that of the cable. Particular care is exercised in thoroughly grounding the metal house and equipment frame wherever they are installed.

Considering the difference in cost between the use of outdoor and indoor type switching and metering equipment, an appreciable saving is realized through the utilization of indoor equipment. Another important advantage is the reduction in first cost of a given substation, since future requirements may be taken care of readily as they materialize by the installation of additional units. A relatively high salvage value also is enjoyed in the use of these units as they literally may be picked up bodily and transferred to new locations as desired.

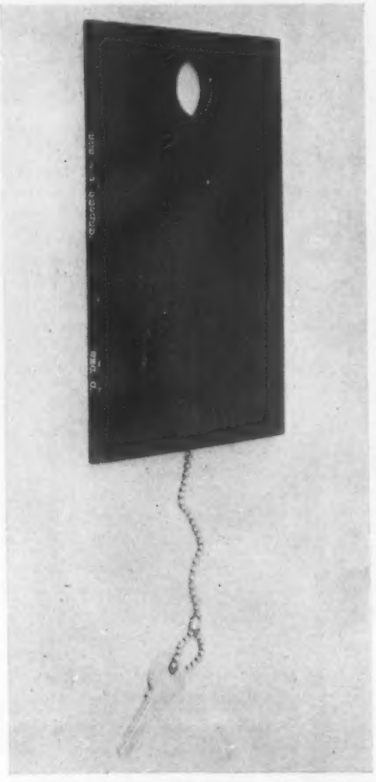
As far as appearances are concerned, when a group of these units is lined up and painted two coats of standard grey paint, the equipment blends very well and presents a neat appearance.

Switchhouse roof hatch, type "RB"

Key Tag Encourages Prompt Return to Proper Place

Keys, such as those used for safety locks on switch racks, for important switch positions and for similar purposes around a substation or power house, too frequently have the unhappy propensity of becoming lost when most needed. A key is a very small thing, and when subject to use by many members of a large substation crew rather easily becomes misplaced or finds its way into a convenient pocket to be discovered some time later.

The "non-losable" key arrangement shown in the accompanying illustration has been in use for some time at important substations of the Los Angeles Bureau of Power and Light. Each key required for the various locked switched positions is attached by means of a metal chain to a piece of Bakelite, or similar composition material, about 6 x 8 in. in size and ¼ in. thick. Each key bears its own identifying number,



Just try to drop this key into your vest pocket

and in addition to this the name and number of the particular switch position is stamped into the edge of the key tag and the stamped letters are filled with white paint so that they may be read easily. This "tag" has been found effective in getting keys back to their proper hooks. It is too large to go into a pocket and large enough to be seen easily if dropped or carelessly laid down somewhere.

Simplified Method Expedites Field Testing in Synchronous Condensers and Generators

By A. D. IRION, Shop-Test Department, Southern California Edison Company, Alhambra, Calif.

A METHOD of field testing having several distinct advantages has been developed by the shop-test department of the Southern California Edison Company. The method has been developed particularly for the purpose of locating short-circuited turns in the fields of rotating machinery since such short-circuited turns have been found to have a very definite bearing upon equipment outage. Specifically, the Edison company's test method has the following advantages:

1. Short-circuited turns can be detected readily.
2. Alternating current is used, with resulting simplifiaction.
3. No special instruments required, another item in simplification.
4. Rotor may or may not be in stator.

Until comparatively recently the matter of a few short circuited turns on field poles of condensers and generators has been given but slight attention. However, Edison operating experience has shown conclusively that grounds on field circuits with resulting equipment damage and outage have resulted directly from short circuited turns on the field pole. Investigations have revealed that the shorted turn or turns have become excessively overheated, causing damage to the insulation and resulting eventually in a ground. This overheating action occurs of course because of the transformer action that takes place, particularly in a condenser while it is being started. The alternating current in the armature winding at the time of starting induces a current in a shorted turn or turns in a manner similar to that in which a current correspondingly is induced in the field winding.

For the purpose of making its test the Edison company has outlined a definite procedure which may be easily interpreted. All that is needed for the test is a source of 110 or 220 volts a.c. single phase, a light duty control rheostat, a portable ammeter and a portable voltmeter of reasonable accuracy. This equipment is laid out as indicated in the accompanying illustration.

As may be noted, a pair of poles is included in each successive test circuit. The connection shows poles No. 2 and 3 under test with test voltmeter readings being taken across pole No. 2 and across pole No. 3. The next setting would be across poles 3 and 4 and the next across poles 4 and 5, and so on until the entire circuit has been checked. A value of current sufficient to give approximately a 100-volt drop per pole is used and this value of current is held constant for all readings on a given machine.

A typical set of test results is shown in Table I, which covers a test on a ten-pole machine. This tabulation shows how the data may be interpreted. The poles having low readings indicate the presence of short-circuited turns. These may be located accurately immediately after the test circuit is closed by running a finger over the ends of the turns and noting which turn or turns become hot. This gives a check on the results

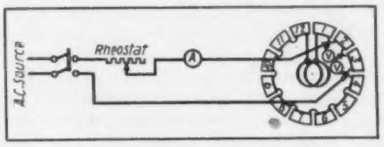
TABLE I

Test Data on Ten-Pole Machines

Pole No.	Volts	Amperes
1	105.2	5.0
2	105.4	5.0
2	104.6	5.0
3	100.5	5.0
3	100.5	5.0
4	101.0	5.0
4	100.4	5.0
5	96.9	5.0
5	97.2	5.0
6	99.2	5.0
6	97.0	5.0
7	87.0	5.0
7	78.8	5.0
8	47.2	5.0
8	49.8	5.0
9	91.0	5.0
9	101.0	5.0
10	105.5	5.0

otherwise interpreted from the readings. In some cases slight voltage variations are encountered caused by unequal air gaps between field poles and stator or by the fact that the adjacent poles are not exactly magnetically equidistant from each other.

Referring specifically to some of the tabulated data, it may be noted that the low voltage reading on pole No. 8 indicates short circuited turns in the windings of that particular pole. This accounts also for the readings on poles 7 and 8 being below normal because the back-electromotive force of the poles being excited is reduced by the effect of the short-circuited turn or turns in



Circuit for generator field test

the magnetic circuit. The low voltage noted across pole No. 5 may be due to slight trouble or due to inequalities in the magnetic circuit.

The presence of a few short-circuited turns in a generator field circuit usually does not interfere with the normal operation of the machine because a generator is not subjected to the rather heavy transformer action encountered

in a synchronous condenser under static conditions. Thus the described test system is applied more frequently to synchronous condensers than to generators, although it is equally applicable to both. The repair of field poles afflicted with short-circuited turns of course requires the pole being removed from the machine and insulation inserted between the turns in trouble.

In a case where all the field poles of a condenser are removed from the machine and it may be desired to make short-circuited turn tests before reinstalling the poles, the portable magnetic core, shown in Figs. 2 and 3, is employed. This portable core is made up of laminations salvaged from an obsolete power transformer. It is approximately 22 x25 x 32 in. in over-all dimensions and each leg is 6¾ in. in thickness. The completely assembled units weigh 3,660 lb. and thus can be transported readily on a medium-sized truck.

As may be noted in the illustration, the top section of the portable core may be lifted off and the field coil to be tested placed over the core, one leg inside and one outside. The top section of the core than is replaced and tightly clamped to insure a good magnetic circuit. This test of course requires that the field coil be removed from its pole.

Any local station service circuit supplying 220 or 440 volts a.c. single phase serves as a source of test voltage, which then is impressed directly across the coil ends. In case of a shorted turn the resulting transformer action is apparent at once and the shorted turn may be readily located and easily repaired.

Tests on similar coils show variations in exciting current as taken from the line to be less than 2 or 3 per cent when all turns are insulated. One short-circuited turn causes an increase of from 10 to 25 per cent in exciting current for the same voltage impressed. This test voltage, 400 volts a.c., impressed across a pole winding, may seem somewhat high. However, this value of test voltage impressed on a field coil results in a turn-to-turn test voltage of only 4 volts for the average winding, a value well within reason.

Another test method that is in common use elsewhere is to excite each field pole with direct current and then take drop readings directly across each turn. This method, however, is tedious and sometimes very difficult to perform under field conditions. Further, it requires special low reading instruments if the results obtained are to be reliable at all. The described a.c. test method, while differing from ordinary methods employed in the factories and by other utilities, has proved itself completely satisfactory. The method described has been used by the Edison company for an extensive period.

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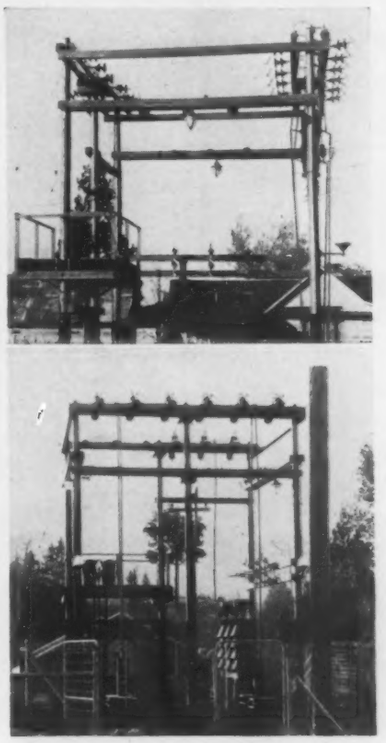


Two views of the outdoor switching station of the Joseph plant. In the lower view the power house building may be seen in the background

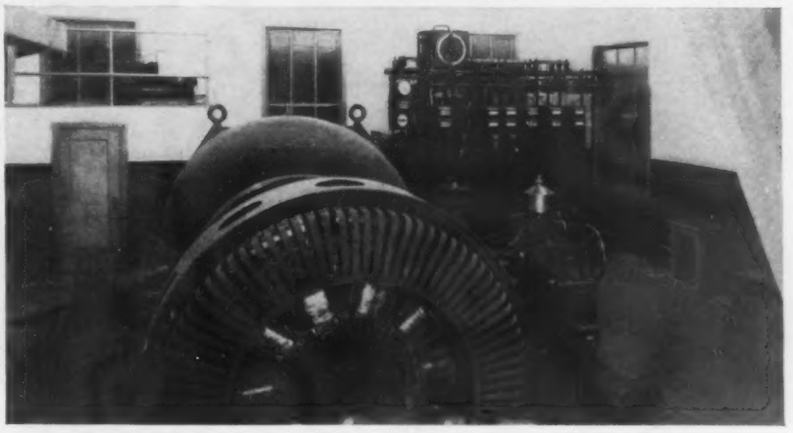
Small Hydro Plant Increases Eastern Oregon Generating Facilities

MORE than doubling the local generating facilities of the Enterprise (Ore.) district of the Pacific Power & Light Company, the Joseph hydro-electric plant on the Wallowa River officially went into service early in November. This plant contains a single unit comprising a 1,450-hp., horizontal Pelton turbine direct-connected to a 1,250-kva. 2.3-kv. Westinghouse generator. Local distribution at 2.3 kv. is supplied directly from the station bus, while a 1,200-kva. bank of transformers housed in the power house building steps the voltage up to 11 kv. for transmission through an outdoor switching station to more remote parts of the district.

No dam was necessary in connection with this development, since arrangements were made with seven different irrigation companies for the use of the waters stored in Wallowa Lake by a dam jointly owned by those companies. Water control is effected by a hand-operated gate at the intake and a motor-driven butterfly valve at the entrance to the turbine scroll case. It is contemplated that under full load conditions about 100 sec.-ft. of water at a head varying between 153 and 163 ft. will serve the needs of the plant. This water is carried from Wallowa Lake to the plant, a distance of some 6,600 ft., through a 48-in. wood-stave pipe line.

The waterwheel is equipped with a standard Pelton governor and the equipment has been laid out to facilitate the installation of automatic and remote control apparatus which will place the plant under the operating supervision of the operator in another plant six miles away. At present the Joseph plant requires the services of a resident operator when it is in service. It is designed to supplement the older Wallowa Falls plant by carrying the growing district peak and through its availability as a standby plant.

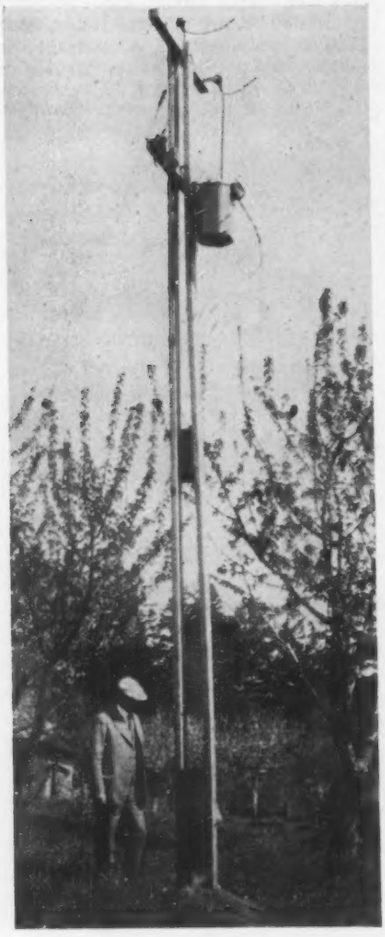
The power house building is a good-looking brick structure with a Transite roof. The entire development was completed in about four months' time at a cost of approximately $150,000.



Interior of new 1,250-kva. Joseph hydro-electric plant of the Pacific Power & Light Company

Another Experiment in Low-Cost Rural Line Construction

By D. A. WRIGHT, Division Superintendent, Portland Electric Power Company, Salem, Oregon



A "standard" simplified line support made up of two 2 x 6-in. 22-ft. timbers, one 8 x 10-in. treated railroad tie, two 4 x 4-in. crossarms and one 4 x 6-in. spacer and Stiffener

NECESSITY of keeping investment costs down to a minimum in serving 31 truck farmers strung out over a distance of more than three miles near Salem, Ore., led the Portland Electric Power Company to try an experiment in off-standard rural line construction.

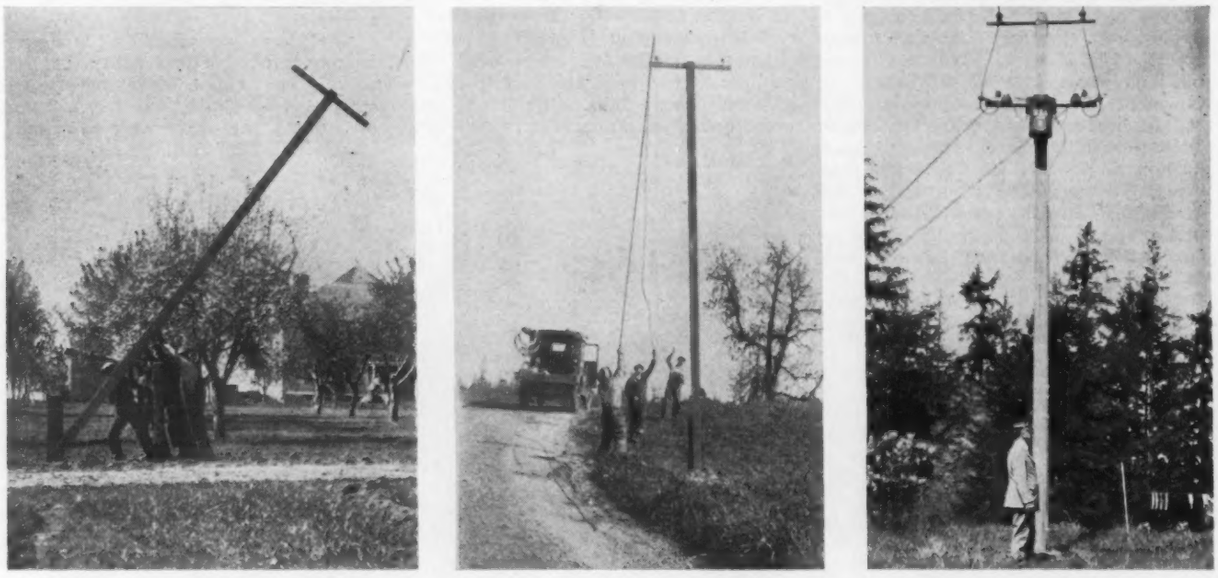
Other than fixed charges, some of the conditions encountered which influenced the design and construction of the line in question included taking the line across private property and across ground which would not support the weight of line construction trucks. Soil encountered was of a very light character, known as "beaver dam" land, which would not support concentrated weight. Thus practically all of the material utilized had to be carried by hand from the nearest road to the point of erection.

Consideration of these and other factors led to the design of a 2.3-kv. line of No. 6 hard-drawn copper conductors, supported upon "pole substitutes." These line supports were each built up of one standard creosoted railroad tie as the foundation piece with two 2 x 6-in. timbers spiked to the tie supporting one or more 4 x 4-in. crossarms.

With each line support thus made up of only four pieces of material, the assembly of the complete structure was relatively simple. First the 8 x 10-in. full-treated railroad tie was set into the ground to a depth of about 3.5 ft. Next the two 2 x 6-in. timbers each 22 ft. long were laid on the ground, one on either side of the tie (in the longitudinal direction of the line) with one end flush with the tie. A single spike driven through the end of the 2 x 6-in. timber into the tie just above the ground line then served both as a physical support and a hinge on which the members could be swung into a vertical position. With the timbers fastened at one end to the tie and lying on the ground, the 4 x 4-in. crossarm was placed between the outer ends and solidly nailed in place. A short piece of 4 x 6-in. material placed between the upright pieces at a point midway between the crossarm and the top of the tie served as a stiffener and a spreader. With the assembly thus made it was a simple matter to raise each support into an upright position by hand or with pike poles and to secure it rigidly to the tie with additional spikes.

Where two crossarms were needed, the second 4 x 4-in. piece was placed at the proper distance from the upper arm and nailed into place. No bolts were used in any part of the structure. The complete structure, when finally in place, presents practically the same appearance as an ordinary pole. In stringing the conductors it was found simpler in many instances to raise the wires up over the arms with pike poles direct from the ground rather than to climb the supporting structure.

Total cost of the line, which included 61 supporting structures and five trans-



Three steps in the construction of an economical rural distribution line. At the left may be seen a crew raising one of the "poles," swinging it up on the hinge provided by a single spike driven through the uprights near the ground line. In the center a crew may be seen placing conductors upon the crossarm with the help of a pike hole, obviating climbing. At the right is a completed structure

former installations, was $2,233, including $93 right-of-way costs. Average cost per support in place complete and ready for service amounted to $14.47. As compared with this figure, the installed cost of a standard 35-ft. pole in another line built at the same time was $27. This low-cost rural line was built in 1927 and has operated successfully and without trouble since that time. A reasonably long life is expected of the line because of the use of creosoted ties as foundation pieces for the structures.

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Contract Hauling of Heavy Power Equipment Through City Traffic Proves Economical

By C. M. ALLEN,
Junior Electrical Engineer,
Construction Division
Bureau of Power and Light,
City of Los Angeles

SEVEN 26,667-kva., 132/11/33-kv., three-winding transformers, weighing 70 tons each and destined for service at major electric substations of the Los Angeles Bureau of Power and Light, were hauled a distance aggregating approximately 25 "transformer" miles at 40 cents per ton-mile. The actual hauling and handling of the transformers was done under contract by a trucking company, familiar with the transportation of heavy loads and equipped with a specially designed 100-ton, 6-wheel rubber tired trailer and heavy-duty Fageol compound-low-gear truck.

The contract called for moving three of the transformers from the railroad cars a distance of about a mile to receiving station "B" and there placing them on a 100-ton transfer truck in the station yard. The contract also called for moving the remaining four transformers a distance of about two miles to receiving station "C" and there placing them in position on their permanent concrete foundations in the station yard. The trucking company assumed all liability against damage while the transformers were in their possession.

Due to limiting railroad clearances, the transformers were shipped without radiators, bushings or other accessories. Their height was reduced to a minimum by means of two-piece tanks and special oil-tight shipping tops on the lower half of the tank which contained the core and its winding in oil. In this way the normal unit weight was cut from 95 tons to 70 tons. Auxiliary and the miscellaneous parts involved were handled by means of truck cranes and standard 5-ton trucks.

At the railroad siding with the trailer alongside of the depressed-floor railroad cars, the transformer units were jacked up sufficiently to permit sections of rail to be laid from the car to the trailer. This rail track was supported by the necessary cribbing in the narrow space between car and trailer. By means of two trucks equipped with power winches the transformers were easily and safely rolled onto the trailer. At their destination the transformers were unloaded in a similar manner.

No grades were encountered in the hauling job, but a variety of road surfaces and conditions was encountered including dirt, oil and gravel, macadam and concrete surfaces. By the use of 12-ft. lengths of 3 x 12-in. hard Eastern oak planks laid endwise, two abeast for each tread, the dirt and soft macadam roads were negotiated with little difficulty. On the concrete pavement the planking was not necessary and the load moved along at a speed varying from five to ten miles per hour.

The time required to complete the transfer of all transformers and related equipment was 96.5 hours, and the cost involved was $24.50 per hour for contracted labor and equipment. A resulting cost of approximately 40 cents per ton-mile and the fact that the heavy units were transported through city streets without mishaps demonstrated the advisability of using modern equipment of ample capacity for such work.

Equipment and methods used in handling 70-ton transformers. Power winch may be noted on the froward truck in the upper view. In the center, some idea of 100-ton trailer may be gathered. In the lower view may be seen a transfer under way from trailer to transfer car. Note the cables to the winch in the background and to the truck at the left.

Ideas for the Contractor

MEMORABLE LIGHTING

Without Glare a War Memorial Bronze Base to a Flagpole Is Lighted Satisfactorily

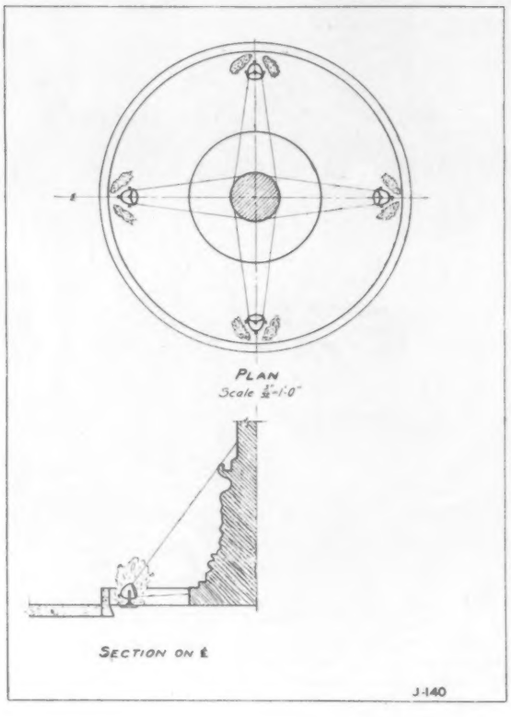
MOST picturesque of the many entrances to Pasadena, Calif., is that over the beautiful Colorado St. bridge. At the east terminal of this bridge is a small plaza containing the city's memorial to the soldier dead of the World War. The memorial is in the form of a bronze relief which forms the base of a tall flagpole.

It has long been the desire of the park committee of the city to extend the value of this memorial visually to the night as well as the day. Several obstacles, however, presented themselves.

The bronze has been set on a small island of green grass and shrubs in the center of the plaza. Floodlights, when located at the base of the shaft, gave such distorted shadow effects to the relief figures of the bronze as to be hideous. If the floodlight beams were projected from a distance the shadows became more natural, but the glare past the shaft became a menace to traffic.

ABOVE: *The bronze as it appears at night. The shadows are all normal and enhance the detail of the figures*

Pasadena placed its war memorial, in the form of a bronze, at the entrance to the city over the Colorado St. bridge. Shrubs conceal the floodlighting units from daytime view



LEFT: *Diagram showing placing of units and the restriction of the light beam. Note that no beam passes the shaft*

It was F. B. Nightingale, manager of the lighting department, General Electric Supply Corporation, Los Angeles, who, when called in consultation, solved the peculiar lighting problem. His method of meeting the problem is described in the following, and better illustrated in the accompanying drawing and photographs.

By using four 500-watt floodlights with 12-deg. reflectors, and equipping each of them with a 40-deg. spread lens, which projects a beam of light 14 deg. in the horizontal zone and 42 deg. in the vertical zone, it was only necessary to place the equipment at such a distance from the shaft that the beams of light could not pass it.

By crossing beams as shown in the plan drawing an even distribution was secured without shadow distortion or glare into the passing traffic.

Shrubs planted about the floodlights offered a pleasing daylight concealment.

MUST ENGINEERING BE GIVEN AWAY?

Not in the Least, Thinks George Black of San Bernardino, and He Proves His Argument by Action

"WHEN I entered the electrical business," says George L. Black, San Bernardino, Calif., electrical contractor and engineer—and that last title is not merely tacked on for looks, it means what it says—"I entered with two very definite theories:

"First, that the ultimate consumer should pay for engineering service directly rather than indirectly, and thereby know his true cost for this service.

"Second, that the amount he should pay for the execution of the contract should be based upon the actual cost of the job plus a reasonable percentage for overhead and profit."

With these thoughts in mind, Mr. Black started out to sell the architects, the school board, county board of supervisors and other owners on the idea of adequately engineered jobs. (At this time the school board was lighting only the offices and lavatories in the schools, and engineering services were unheard of among the local architects.) He pointed out to them that the value of any service is proportional to the amount paid for it. Therefore, when they accepted a gratis engineering service, either they had a service of no value or they were paying for it in under-cover charges.

"Skilled advice has a real value and should be paid for accordingly," said Mr. Black. "There is no more reason for a contractor to give free engineering service on a job than there would be for him to give free conduit, wire or labor. If a contractor should come into your office and offer you $100 for a job, probably you would throw him out of your office. Yet you will accept a service from him that often costs many times that much because you have never realized the cost of that service to him. The best that can be said for free engineering service is that it is petty bribery."

There were many other arguments used as the occasion demanded.

As to the results of this campaign, today there is not a job that goes out of any architect's office in San Bernardino, regardless of size, that is not adequately engineered—and the service is paid for. The school board and county supervisors stipulate in their contracts with architects that they shall employ an electrical engineer acceptable to them, "and they make it known that the engineer who is acceptable to them is myself," continues Mr. Black.

The result is that today the average cost for electric systems in public and commercial buildings in San Bernardino is 9 per cent of the cost of the buildings, and the schools are adequately wired. "In fact I just rewired a high school at a cost of $12,000 on a time and material basis. I also do engineering for architects in Riverside, Redlands, and Los Angeles."

A question that naturally arises when operating a combination engineering-contracting business is how can one compete fairly with other contractors for the job when one is the inspector on the job? The answer is that Mr. Black deducts 1¼ per cent from his fee in order that the owner may employ an independent engineer to inspect the job in the event that he is awarded the contract.

The following is an extract from Mr. Black's advertising:

"In order to produce an electrical system for a modern building that will be adequate ten or twenty years hence, the engineer must have behind him a broad experience backed by the best of service. That I have to offer you in the design and execution of your electrical system."

"My engineering business makes me independent of price wars in the contracting field because I can withdraw from contracting until prices are stabilized. My engineering will carry all of my overhead charges," he declares.

Now for a few words about the contracting end of the business. As a result of his contacts through engineering Mr. Black gets most of his contracts on a cost-plus basis, or gets a preference on the job. For instance, on the San Bernardino county court house he was $5,000 high, but was awarded the job. His cost-plus jobs run from two to forty thousand dollars in size.

"That is about all that I know to tell you," he finishes, "except that I want to say that any contractor who gives free engineering service should likewise give a free toaster with each carton of lamps."

▼

Book Tells How to Stop Radio Static

One of the major problems facing the radio trade is the elimination of the "man made static" which causes so much unnecessary interference with radio reception.

These extraneous noises in the radio receiver are controllable and can be eliminated. How to do it is explained fully in the latest edition of the "R M A Better Radio Reception Manual" which has recently been published by the engineering division of the Radio Manufacturers Association.

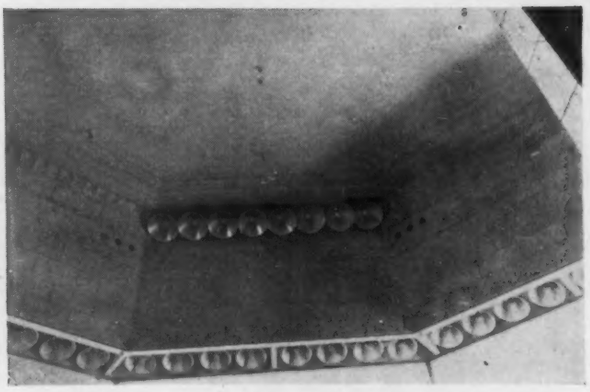
The new manual gives detailed information as to the various types of electrical appliances which are liable to cause interference, how the cause of the noise can be located, and, finally, how the noises can be eliminated through the installation of various types of filters.

The booklet contains over a dozen wiring diagrams covering every major type of static producer and is the only information of its kind ever made available in one book.

The price of the manual is 25 cents and copies can be obtained from the Radio Manufacturers Association, 32 West Randolph St., Chicago, Ill.

▼

THERMOSTAT SWITCH GUARDS ORANGE GROVE—A logical though somewhat novel use for a thermostatically controlled switch is for the protection of orange groves from freezing weather. The Penn Electric Switch Company recently had one of its thermostat switches, set for 34 deg. F., installed on a ranch near Los Angeles. If the temperature of the air drops to this level the switch operates an alarm which gives warning that it is time to light the smudge pots and save the fruit from frost damage. Smudge pots, in this case, are kept in readiness so that at the alarm only lighting is required.

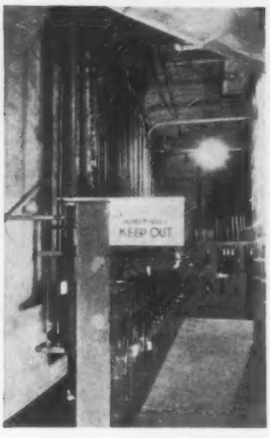


BON MARCHE—SEATTLE

[First of a series picturing interesting installation features in Pacific Coast department stores recently built or remodeled]

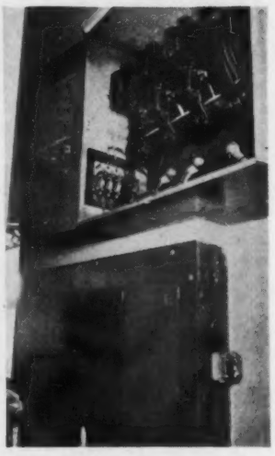
SAID to be the largest interior wiring job in the Pacific Northwest, the recently completed Bon Marché department store in Seattle is unique in many respects. Modernistic lighting and decoration, windows on all four sides, and the capacity of its electrical equipment, are features of it. It was designed by John Graham, architect; erected by Tuefel & Carlson; the electrical design was by C. H. Knowles; and Meecham & Babcock were the electrical contractors. Oscar Olson, of the latter firm, superintended the installation.

BELOW: *Neat, compact, the main switchboard, made locally by the A-G company, is installed in workmanlike manner*



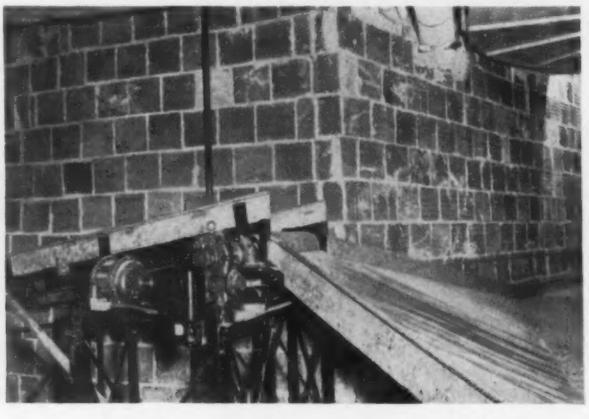
BELOW *left: One of the ground-glass panels in the marquee around the entire building, each containing five 200-watt lamps*

Modernistic lighting fixtures consisting of cones of spun aluminum are used throughout. On the main floor there are 91 units like that above equipped with 1,000-watt lamps, and 90 like those shown at the top of the page (which are used on all other floors except the first) using 300-watt lamps



ABOVE: *At the top of page is shown lighting and spot outlet equipment in each of three corner windows: 26 200-watt spun aluminum reflectors at the window and eight 300-watt at the ceiling. Just below it is one of the six 500-amp. magnetic circuit breaker switches controlling window lighting from the superintendent's office. Circuit switch and fuse panel are below it*

BELOW: *Part of an extensive parcel conveyor system*



INDIVIDUAL CONTROL

Complete Flexibility Is Possible Where Each Unit Is a Law Unto Itself

By Ralph T. Dickey

REALIZING the inadequacy of the average window lighting installation with regard to control of the various lighting units from a remote location, the Bureau of Power and Light of the City of Los Angeles decided to use their own windows as actual examples, representing the latest developments in this phase of window illumination.

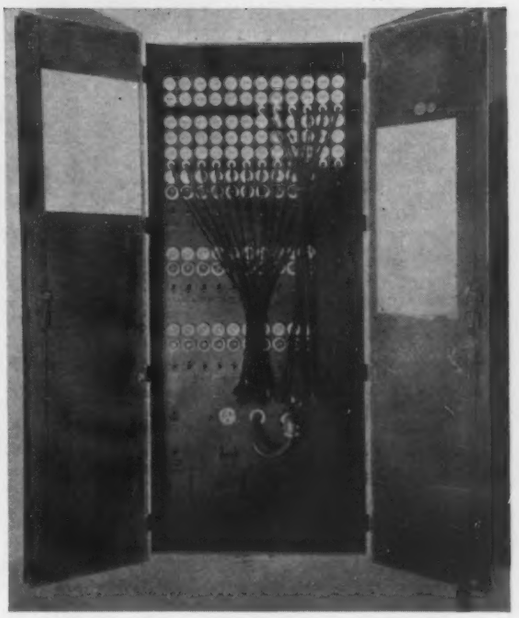
A window may have sufficient foot-candle illumination, the units may be properly spaced, but yet the window decorator's hands are tied if he wishes to flood his window alternately with one color and then another, or to increase or decrease the amount of light in his window. This installation was made as an illustration of what could be accomplished in flexible window lighting.

Three small windows, approximately 6 ft. wide and 2 ft. deep, and one window 6 ft. wide by 9 ft. deep were the windows selected for this demonstration and installation.

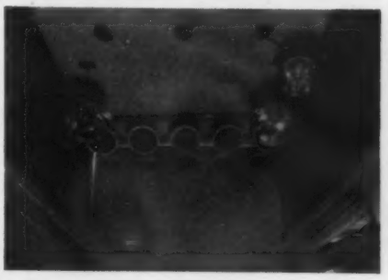
In the small windows five 200-watt reflectors were used and in the large window ten 200-watt and two 500-watt reflectors were installed. A separate circuit from each lighting unit is brought to a panel box, as shown in the illustrations, and ends in a cord and plug and is capable of being plugged in any receptacle on this panelboard. These receptacles are in turn connected to different legs of a flasher or to a time switch.

This plugging or switching arrangement gives any combination of lights desired either on the flasher or time switch. All convenience outlets are on individual circuits and terminate in the panelboard in a cord and plug, just as with the lighting circuits.

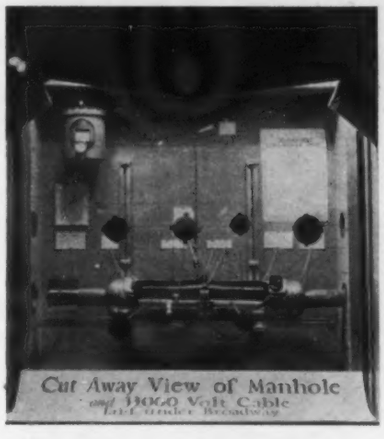
Thus any light in the window may be flashed on and off by itself or in combination with any other lights desired. By using various color-screens on individual reflectors and plugging these circuits in on the flasher, beautiful tints and effects may be obtained. A window illuminated by one color assumes an en-



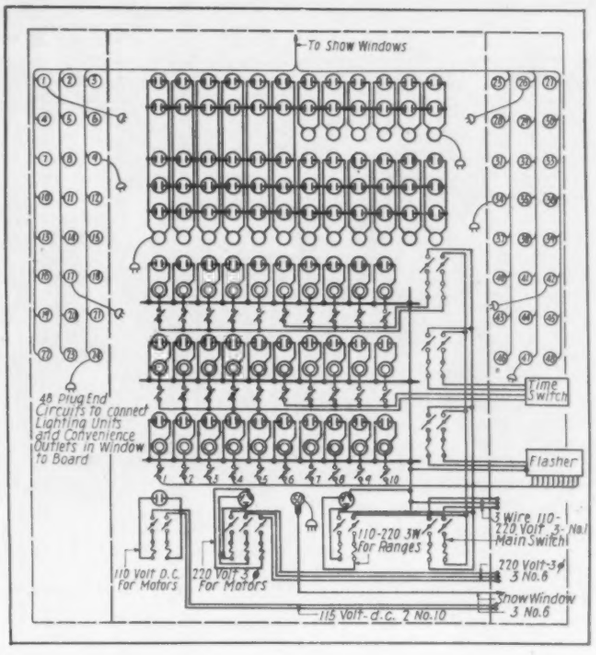
RIGHT: *The plug-in board in the basement from which all units in the windows can be individually and automatically controlled. Each cord is labeled as well as each outlet plug*



ABOVE: *One of the narrow windows showing the number of units mounted and the ceiling plug outlets for still more if necessary*



One of the windows lighted


To Show Windows
48 Plug End Circuits to connect Lighting Units and Convenience Outlets in Window to Board
Time Switch
Flasher
3 Wire 110-220 Volt 3-Pole Main Switch
110-220 3W for Ranges
110 Volt D.C. for Motors
220 Volt 3ϕ For Motors
220 Volt-3ϕ 3 No.6
Show Window 3 No.6
115 Volt-d.c. 2 No.10

Schematic diagram of wiring of the plug-in board showing arrangement of circuits and flashers

tirely different aspect from that under another color.

An up-to-date window trimmer realizes the value of color in displaying merchandise and also the reaction of passers-by to changes in color. Changes of color in a window compel pedestrians to stop and look. The modern merchant is willing to spend money to do this. A lucrative field is waiting for the contractor-dealer in window lighting and the live one will cash in on it.

The large window is also wired with a 110-volt, direct-current plug; a 3-phase 220-volt circuit for motors; a 220-volt heating circuit; and a 3-wire 110-220-volt range circuit for demonstrating ranges. Every circuit is protected by the proper size of fuse.

The Bureau of Power and Light engineers designed and installed this lighting equipment under the direction of A. W. Elliott who is in charge of the display rooms maintained in Los Angeles. Much favorable comment has been received and several merchants in Los Angeles already have signified their intention of installing similar equipment in their windows.

▼

Grip for Pulling Wire Now Developed

A recent development of value to contractors is a small cable grip for pulling wire through branch circuit conduits. Cable grips have been used on lead-covered cable for a number of years, but this is the first time one has ever been adapted to wire. In large installations appreciable savings have been made in both wiring and labor by the use of the grip. It has been introduced by Kellems Products, Inc., and is called Kellems Junior.

The grip entirely does away with the old method of skinning the wires, bending the copper conductors through the hook in the fish wire, and twisting them together. Under the old method

it was necessary to strip back each wire about three inches, and as this wire was cut off and thrown away the saving that is made with the new grip can be seen readily. Losing 3 in. on each of four wires meant a foot of wire wasted on every pull.

The new method is also much quicker. The wires are merely held together and slipped into the grip, the whole operation taking about half a minute. It is also much safer, for it eliminates the danger of copper slivers and cuts in the workman's hands.

Testing is greatly facilitated. As the insulation is intact on the wire and each wire is separate from the others there is no possibility of wires being forgotten and left twisted together. It has often happened in the latter instance that a switch might inadvertently be thrown, causing a short circuit and much damage and annoyance.

▼

Lighting Series to Be Resumed Later

On account of the illness which on March 12 terminated in the death of J. R. Wilson, author of a series of articles on the planning and selling of industrial lighting, ELECTRICAL WEST has had to forego publishing the series temporarily. This series of articles, particularly in the last two or three installments, in which the pictorial method of presenting the data was employed, has been in such demand that efforts are being made to have it continued to its logical conclusion.

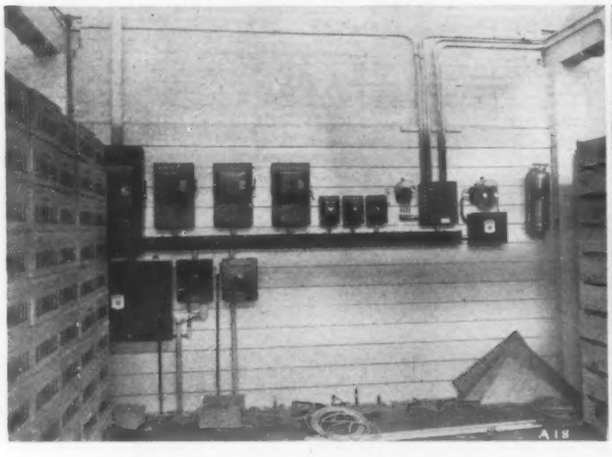
Mr. Wilson's articles were always particularly valuable to the practical contractor and estimator because they were handled from the standpoint of the practical experience he himself had gained in such installations over a 30-year period. In resuming the series every effort will be made to have it carried on by a man of similar practical job experience, a man with a quality and a selling viewpoint. In this way ELECTRICAL WEST hopes to continue to make this information of real worth to its readers in the installation and engineering fields.

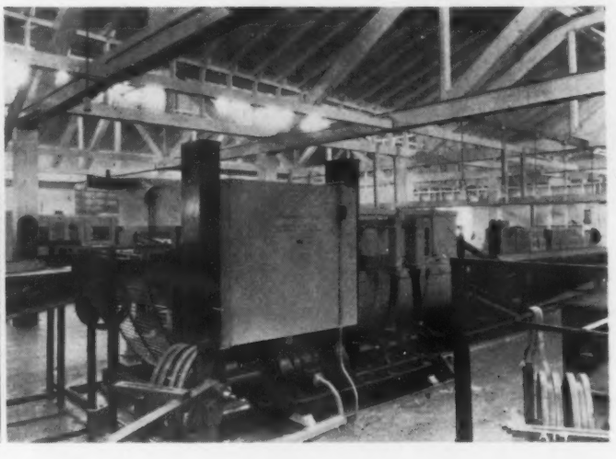
▼

"LOOKING AHEAD IN AVIATION LIGHTING"—This title has been given to two lighting data bulletins issued recently by the Edison Lamp Works and the National Lamp Works of the General Electric Company, respectively. The material was prepared in collaboration and both books are identical. The entire history of the use of light in connection with aviation in the lighting of airways, of airports, of air marking and signaling, and of lighting the aircraft itself, is covered. It is profusely illustrated by diagrams and pictures of equipment and installation methods.

▼

HEAT INSULATION IN BUILDINGS—A new bulletin, No. 376, of the Bureau of Standards, entitled "Thermal Insulation of Buildings," contains considerable data which should be of value to the electrical engineer or contractor planning residential heating installations. The relative values of various forms of insulating material, both for heating and for refrigeration, are considered in this manual.





Washing Sprays From Apples Requires Power Installation

EVERY apple and pear shipped is required to be thoroughly scrubbed to remove the spray poison which guards it from insects. At the new Kimball packing plant at Medford, Ore., The Peoples Electric Company of that city installed 60 hp. in motors for washing and conveyor equipment. At left, the switchboard under construction. Right, the apple washer

RANGE WIRING IN THE NORTHWEST

Minimum Specifications Recommended by a Special Committee to the Northwest Section, I.A.E.I.

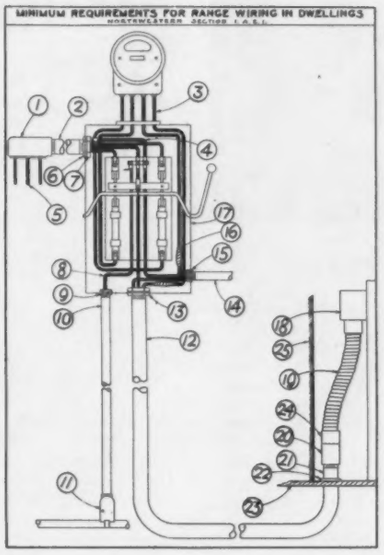
DEMAND from all concerned in the electrical industry and the public for a standard set of minimum requirements that would provide a safe installation and one of reasonable cost, caused the appointment of a special committee of the Northwest Section of the International Association of Electrical Inspectors. This committee consisted of A. M. McLean, chairman, A. A. Tobey, H. E. Rinabarger, C. B. Gleason and C. O. Murchison, and made the following report to the last meeting of the association. The form of the recommended standard is simple and easily understood. It consists of the drawing shown here and a brief description of it.

Probably the most important departure from the National Electrical Code shown in this drawing is the omission of the individual fuses required to protect the conductors supplying heating appliances of more than 20-amp. rating. The committee was of the opinion that where no change is made in the size of the conductors between the service cutout and range terminals the hazards of the installation are not increased. Under some inspection jurisdictions this practice has been commonly accepted. The disadvantage with this arrangement is that any trouble occurring between the service cutout and range terminals would also shut off current from the branch lighting and appliance circuits, but where the conductors are installed in conduit without splices this possibility is reduced. This type of installation has been permitted in Portland for some time past and seems to have proved satisfactory, particularly in apartment house installations.

The Portland rule covering this particular condition reads as follows:

Except as modified by paragraphs (a) and (b) of this section, the rating of the fuses protecting a heating appliance circuit shall not exceed 150 per cent of the full load current rating of the appliance. Where there is no approved fuse of the calculated size, the next standard fuse rating may be taken.

Fuses, however, probably would be employed where large service conductors are required, as the increase in cost of installing the larger range conductors would more than pay for the additional fuse protection required. The detailed explanation follows:



SPECIFICATIONS OF MINIMUM REQUIREMENTS FOR RANGE WIRING IN DWELLINGS. NORTHWESTERN SECTION—I.A.E.I.

NOTE: It is the intention of this drawing and these specifications to show the minimum requirements for range wiring when combined with existing lighting and appliance circuits in dwellings, as recommended by this committee.

It is understood that all materials and devices used in this installation are approved as defined in Article I of the N.E.C.

Explanation of Items Shown on Drawing

1. Weatherproof conduit fitting.
2. Service conduit. Minimum size 1 in. where conductors supply combined range, lighting and appliance loads.
3. Meter loop. See detail following.
4. Grounding conductor for service conduit. See detail following.
5. Service conductors to extend 18 in. beyond service head. For size see detail following.
6. Double locknuts required.
7. Conduit grounding bushing.
8. Grounding conductor for service conduit and interior wiring system to be not less than No. 8.
9. Double locknuts required.
10. Conduit containing grounding conductors. See detail following.
11. Grounding fitting (enclosed type). See detail following.
12. Conduit containing range circuit conductors. Minimum size ¾ in.
13. Double locknuts required.
14. Conduit containing conductors supplying existing lighting and appliance circuits. (Size determined by wattage requirements.)
15. Double locknuts required.
16. Taps to supply existing lighting and appliance circuits. When the length of these taps exceeds 3 ft. a cutout shall be required. For size of tap conductors see wattage requirements.
17. Three-pole, solid neutral, safety type enclosed switch rated not less than 60 amp., 250 volts, with not less than 2½-in. spacing between switch base and top and bottom ends of switch enclosure.
18. Terminal box on range.
19. Flexible conduit for range connection to be not longer than necessary to permit the range to be moved 10 in. from wall.
20. Conduit coupling or box. No splices to be made at this point. If box is used it shall be secured to wall.
21. Range conduit at this point to be extended at least 3 in. above floor.
22. Floor flange (optional).
23. Floor.
24. Flexible conduit connector.
25. Wall.

Minimum Size of Service Conductors for Combined Range, Lighting and Appliance Loads

In determining the size of service conductors required for supplying current to a combination lighting and range load, a minimum of one watt per sq.ft. for ceiling outlets and for ordinary convenience outlets shall be required, in addition to the wattage of the range. The area to be considered in making these computations shall be the gross area determined by the outside dimensions of the buildings and by the number of floors, excluding basements or cellars, unfinished attics and open porches. In addition to the load thus computed, a minimum of 1,000 watts for appliances in each dwelling or apartment, a minimum of 50 watts for all bracket outlets, and a minimum of 50 watts for all other outlets not located in the gross area shall be required.

If medium duty appliance branch circuits have been provided for the connection of larger capacity appliances, the required wattage for the first such circuit shall be considered to be 2,000 watts, and for each additional circuit 1,000 watts. The wattage requirements specified are based on average load conditions as found in dwellings. In any event, where the minimum wattage provisions herein specified will not equal the actual demand, then the size of service or feeder conductors must be increased.

The minimum size of conductors supplying current to combined range and branch lighting and appliance circuits shall be not less than No. 6.

Minimum Size of Range Conductor:

The minimum size of range conductors shall be No. 8. Where individual fuses are not provided for the protection of the range circuit, the conductors shall be of the same size as the service conductors. Where an individual cutout is installed in the range circuit it shall have a rating of not less than 31-60 amp.

Grounding:

The method of grounding the service conduit and service conductor shown on the drawing is only permitted to be used where the distribution system is grounded at two or more locations not in the same building to a continuous underground "cold water" piping system. For other conditions see Section 904 (d) in the proposed revisions of the 1928 N.E.C.

Meter Loop:

In locations where the meter cannot be installed as shown in the drawing, it shall be wired from the side of the service switch box in rigid metal conduit with an approved fitting having bushed openings in a horizontal line located immediately below the meter space. The minimum unobstructed meter space shall be 12 x 12 in.

Wiring Method:

All conductors shall be installed in rigid metal conduit, including the sub-feeder circuit, except where the use of rigid metal conduit would be impracticable, in which case flexible metal conduit shall be used.

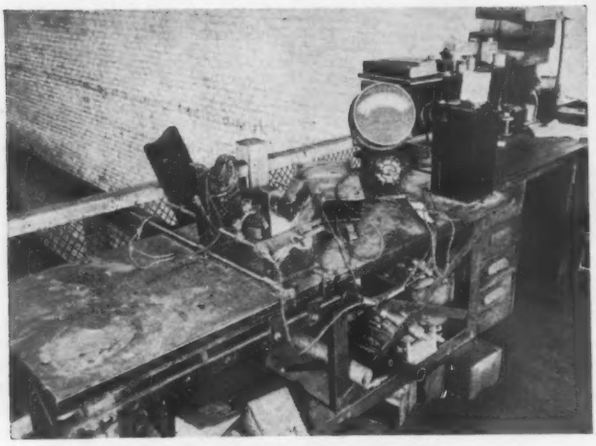
Location of Service Switch:

See Article 405 and Article 1,603, N.E.C. 1928.

REMARKS: The N.E.C. shall be referred to for details not specifically covered in these specifications or accompanying drawing.

▼

"WIRING OF THE FARM FOR LIGHT, HEAT AND POWER," a recent booklet issued by the Committee on the Relation of Electricity to Agriculture and available to electrical contractors in rural communities by writing to the committee at 1120 Garland Building, Chicago, Ill., is a worthwhile book for the development of farm wiring. It is a complete treatise on farm wiring, both for domestic and for farm uses. It is 80 pages in length profusely illustrated and all technical details are explained in simple language. It recommends high-grade materials and competent installation by the electrical contractor. It should be found a valuable aid in the selling of better types of farm wiring.



"Horse" of a Different Color

FOR testing armatures an ingenious arrangement has been worked out at the Farnsworth Electrical Works, San Francisco. A small "horse" made up of two wooden 2 x 8's notched at one end and provided with clips sliding along parallel iron rails to make them adjustable as to distance apart, are used to mount an armature for testing.

Test instruments are conveniently arranged on the slate-topped table alongside.

Similar horses on which to wind armatures are also made of wood in the shop. The adjustable member of the horse is equipped with an iron loop which circles the wooden base and slides along to required width.

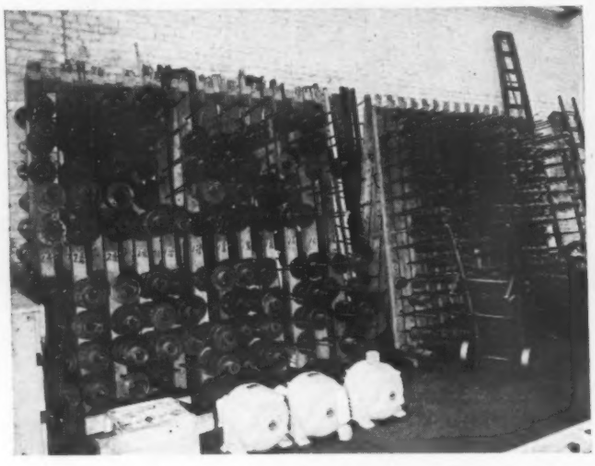
▼ ▼ ▼

Like a Wire Hairbrush

A NOVEL way to store pulley stock is shown in the photograph above. It was developed by Horace Adams, of the Farnsworth Electrical Works, San Francisco, for the storage of hubs for his own line of detachable rim cast iron motor pulleys and flexible couplings, which he has invented. Yet the rack itself can be applied to the storage of any kind of pulleys.

The rack is made up of a number of 2½ x 3½ wooden timbers set on end and bolted to cross members at top and bottom, set at a slight angle from the perpendicular to the floor. At intervals, depending on the sizes of pulleys to be stored, these wooden members have been drilled and pieces of ⅝-in. steel rod about 18 in. long have been driven into the wood at right angles to it. The pulleys are then slipped over these rods.

Resting their weight on the floor, these racks can be picked up with the crane and moved to any desired location when floor rearrangement is under way.



motor

a department for and by Motor Specialists

MORE REASONS FOR MODERNIZATION

Alert Motor Dealers Will Develop Business if They Base Sales Arguments on These Needs of Modern Industry

NINETEEN thirty is a crucial year. It is a year that is going to determine some vital policies as to methods of doing business. The test of stringency is to be applied to methods of selling and distribution, to whether industries and commercial establishments shall absorb all the services they require from outside sources or return to the old basis of attending to their own knitting.

To the motor specialist it is a challenging year. Largely it will determine his fate in the distribution scheme of things. Either the industrial will develop its own internal motor shop or it will decide that it pays to have the independent motor specialist do the installation work and carry that part of the overhead.

Largely it will depend upon the fighting attitude of the motor dealers, their initiative, their inventiveness and skill, whether they are to be eliminated from the economic picture, or whether they swing the tide of consolidation back to individualism. The situation is both a threat and an opportunity.

It is a threat because lack of initiative now will react against the motor specialist. If he fails to do a good selling job now he will lose on two fronts: With the manufacturer whom he represents his position as an outlet for motor equipment will be weakened; with the industrial customer he will be ignored, and a plant electrician will be substituted for him, his equipment, his investment and experience.

It is an opportunity because it is an excellent time to convince the industrial that it can save money, lower its operating overhead, and benefit from up-to-date, modern ideas and methods if it will have a good motor specialist do the entire maintenance work for the plant. It is the time to demonstrate that the wide experience of the motor specialist fits him to offer a constantly fresh fund of information and methods, to apply the newest developments in electrical control and special motor equipment to the production machinery of the industrial plant, and make production safer, quicker and cheaper. The best plant maintenance man, because his experience becomes limited to that plant alone, can never bring this ever fresh fund of knowledge and method to the job.

Study Up on Electronics

Just as in the past practically all the developments in control apparatus by magnetic means were initiated by inventive motor specialists who were asked to meet some peculiar operating requirements of some manufacturing plant, so must the motor specialist be the leader in the adaptation of the new vacuum tube control to industrial uses. If he fails to see the possibilities in this new and limitless field it will be taken away from him by others more alert than he.

As motor-driven machinery more and more is being motor equipped at the factory and the motor market seems to be diminishing, the motor specialist must be the first to pioneer accessory equipment. The arc welding set, for instance, is something motor specialists can now sell profitably. Blower and fan equipment, electric heating applications, electric refrigeration applications, portable tools, instruments and recording control apparatus—all these are logical merchandise for the industrial electrical contractor.

forum

in the interest of a better motor trade

This may require a complete revamping of the motor dealer's own pet viewpoints, and certainly his mental habits. He must begin to think in terms of creating something out of unfelt and unwanted needs. Instead of merely "figuring the job" the attitude must become, "What do you need here that even you don't know you need yet?" The contractor must revisit all his old contacts, not with the question, "Need any wiring or repair work done today?" That is the scissors-grinder technique in selling, and it is passé.

He must ask rather, "Do you mind if I look around a bit? Maybe I can suggest a few ideas that will help. You can take them for what they are worth. I've just learned of some excellent ideas and methods that have a lot of the old ways of doing things backed off the map. Maybe there are places in your plant in which you could take advantage of them and save yourself expense and bother."

The Survey

Then should begin a systematic survey. Nothing else is worth trying. On it the contractor can base his whole case. With the information he gains as to the way work is done, the manner in which machines are operated under actual conditions, the type of equipment driving them and whether or not they are the best thing *now* available with which to drive each particular load, he can make sensible and acceptable suggestions for remodeling the plant or remotorizing equipment and have a fair chance of getting an order to go ahead with it.

He should go through the plant and see for himself whether or not the following conditions prevail:

The Distribution System

Is the distribution system efficient, considering the load centers? Is the system flexible—does it permit easy rearrangement of machines without tearing out whole sections of the system?

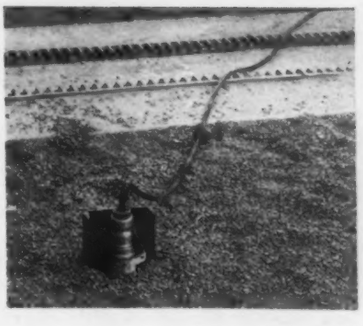
Are feeders sectionalized so that trouble in one place will not shut down the whole plant?

Are its protective devices of sufficient capacity to take care of maximum short circuit conditions?

How about individually metering various departments so that checks on cost of power for certain work can be made and cost controlled?

Are feeder capacities sufficient to minimize the voltage drop which steals the efficiency of motor equipment? How is the voltage regulation? Is power factor bad and is it sufficiently so to warrant devices and rearrangements that will correct it and earn a better rate.

Sell or rent the industrial plant's electric arc welding equipment for making repairs and erecting new buildings. It is the modern, silent way to fabricate steel and other metals



Conveniently located, arcproof outlets to serve mobile units of machinery are a little item that saves the industry time and money and means profitable installation work for the motor specialist

"Out of my line" —not at all. Electrically cooled water units are motor driven. Better yet, they are a profitable line by which the live motor specialist may introduce other modernizing ideas in the revamping of old industrial plants

Can the maximum demand be lowered by rearrangement of work so that peaks do not occur at the same time?

Can future additions be made from existing facilities or should not extra capacity for future demands be added now when production will be least affected by the changes?

What is the condition of the apparatus itself? Does it need new parts and partial or general overhauling?

Motor Equipment

Does the existing motor equipment meet the requirements demanded of it as well as would the more recently designed equipment now available? Will it be worth while replacing such equipment, based on average running over a reasonable period of time? Will more modern motor equipment give better efficiency, better power factor? Is a different torque condition required, better speed regulation or wider range? Is the motor well suited to protection against dust, acid fumes, corrosion or moisture?

How do the performance records of the motors look? How often have they individually had to be repaired? Will a new motor pay in its freedom from this repair cost?

Would a shifting of motors better conditions? Are the best motors on the most important drives? Are they underloaded or overloaded?

Could part of the load be carried better by synchronous motors, thus improving power factor?

Control Equipment

In each application of control is there something newer and better which offers better protection, more reliable operation, and better service? Is it easy for inexperienced people to handle safely? If it requires an electrician to operate, it is probably too costly to keep. How much maintenance does it require? Is it so arranged that should new operating requirements arise it could be changed over easily, quickly and without loss of production to the plant?

Would it be better magnetically controlled than manually controlled, and vice versa? Could the automatic features possible with photo-electric cells, grid glow tubes and other vacuum tube applications be applied with profit to the industrial customer?

No survey would be worth much unless it included a thorough study of the economy of the methods of drive employed.

Lighting and Other Services

Is the lighting system adequate? Is there sufficient capacity in copper should higher intensities be needed in case of a changeover in some part of the plant to work requiring greater visual acuity? Is the system properly designed? What condition is it in—are the reflectors clean, the lamps old and blackened? What are voltage conditions—does the lamp get its properly rated voltage to deliver the light it is supposed to?

What other markets are there possible to develop for blower or air conditioning equipment, refrigeration or cooling equipment, telephone and signal equipments?

Finally, cannot you as a contractor of standing and a proved specialist, make regular periodical inspections of all electrical equipment for the customer, relieving him of responsibility in this respect, saving him the overhead of a plant electrician and keeping so ahead of repairs and replacements that the plant will experience a minimum of interruptions from any cause, mechanical or electrical?

Isn't it worth trying?

Better Merchandising

Superintendent MacQuiddy is enthusiastic about the subject of electrically heated school buildings. Here he is shown explaining to one of the classes at the Mintie White school the importance of keeping the classrooms at the proper temperature

WATSONVILLE ELECTRIFIES ITS SCHOOLS

By
ALMA FREEBURG, President, Women's Division, Coast Counties Gas & Electric Co.

Thomas S. MacQuiddy, superintendent of the Watsonville Public Schools, advances the following arguments in favor of their electrical heating systems:

More healthful
More flexible
Less expensive
Eliminate a great deal of janitor work
Require no storage space

Mr. MacQuiddy also favors floodlighting of public schools because in Watsonville it has done away with the necessity of a night watchman, and kept these schools free from petty thievery and burglary frequent in surrounding territory.

THE little red school house has passed from the California countryside and with it is going what many have thought was the modern school with its oil heating furnace and steam radiators in the class rooms. One has gone and the other is fast departing before the development of the more economical, more efficient and more healthful electrical school.

Watsonville district, as far as its public schools are concerned, has gone electrical. There isn't one public school in Watsonville that is not entirely electrically equipped.

Watsonville's schools are not only electrically heated, but are floodlighted and made modern for one reason only —ECONOMY—spelled with capital letters. It isn't a fad with the school board or with Superintendent Thomas S. MacQuiddy to make these schools, the Mintie White as well as the Radcliff and J. W. Linscott, efficient with electricity. It is a matter of the upkeep cost and the cutting down of the overhead so that there will be more money devoted to educational purposes and less to heating costs and janitor and watchman fees.

CURIOUS TO KNOW THE REASONS

Superintendent MacQuiddy was plied with questions. What were his reasons for pioneering the electrical school?

Here are a few of the things that this executive and educator had to say about the modern trend in school equipment as he expressed the belief that

before long boards of education everywhere will build nothing but electrically equipped schools.

"We are very pleased with electrical heat in all of our schools. In the first place, the teachers like it, for the air in the rooms is absolutely pure. It is not dried out as is the case in many other types of heating. There is no noise, nor any chance for leaky radiators. Furthermore, there is absolutely no odor, soot, smoke nor ashes with electrical heating, which keeps our buildings looking clean and white. Also, it is the most flexible method of heating any building, as it can easily be turned on and off at will.

"Another advantage is found in the fact that it is much simpler and less expensive to install than steam and the cost of operation is about the same, if not less, than steam, taking into consideration the cost of replacements necessary over several years' time.

"It has been computed that the cost of steam heating, over a period of ten years, amounts to approximately $100 per year per room. We believe that our electric heating system is going to come slightly under this figure.

"In addition to this, it eliminates a great deal of janitor work and overseeing necessary for other heating systems. Also, there is no question of storage space. We pay for just what we use. To date we have had no particle of difficulty with the electrical heating systems of our schools."

Corrolitos school, another rural school in the district electrically heated

ABOVE: *The transformer vault at the Mintie White School*

LEFT: *One of the Wesix heaters equipped with a protective baffle to reduce direct radiant heat effect in the room*

On this and the facing page are the Mintie White School as it appears during the day and when floodlighted at night

This raised the question as to whether a great deal of current might not be wasted by burning the heaters when they were not needed. Mr. MacQuiddy's reply was:

"In order to control the cost of current the rooms are checked as to temperature two or three times a day. At the present time we are conducting a contest between the different rooms and schools to see which can keep their electric bill at the lowest figure. This is creating a friendly rivalry and also an interest in the minds of both teacher and pupils as to the proper temperature of schoolrooms."

Asked if windows were kept open, and if this did not run up the cost of fuel, he said:

"We keep two windows in each room open at all times, believing that fresh air is essential to the welfare of the children. These windows are of the three-section type and the two upper sections are kept open, swinging from the top out, which eliminates any draft on the pupils.

"On cold mornings the heaters are started about 7 o'clock, but on moderate mornings, such as are usual in this section of California, it is necessary to start them only from three-quarters to half an hour before school time. Heaters are not burned continually in the corridors, as this is not felt necessary. However, the small additional cost of installation at the time the system was put in made it advisable to include them there too.

"We are very happy with electric heat in all of our schools and would not want to go back to any of the old methods of heating which we have previously tried."

According to Manager N. E. Paulsen of the Watsonville office, Coast Counties Gas & Electric Company, the installation was made by Charles W. Kirkman, Justrite Electric Shop, Watsonville, who said he had installed 38 of the flush-type Wesix heaters in the Mintie White school, a total of 280 kw. Similar heating equipment is also used in the other schools. These heaters consist of 6-kw. heaters in the class rooms, which are placed one in the center of each end of the room, directly under a window, 7-kw. and 6-kw. heaters in the corridors, and a 4-kw. heater in the office.

Both Mr. Kirkman and Mr. Paulsen attribute their satisfaction largely to the fact that a transformer vault has been built in the building. Current is brought in through a lead-covered cable at 4,000 volts. Here in this transformer substation it is cut to 220 and 110 volts, assuring a steady service at all times.

Mr. Paulsen also explained that in co-operation with Milo Cain, illuminat-

ing engineer for the Coast Counties company, Mr. Kirkman had installed five 500-watt X-ray floodlights—three on the ground about 85 ft. in front of the building and two on a 12-ft. pole at a distance of some 110 ft. from the rear of the building. This makes the school visible from almost every section of Watsonville, as well as the surrounding territory.

Superintendent MacQuiddy says this floodlighting was required to serve a two-fold purpose, not alone to beautify the school, but rather for the protection offered by having the grounds and buildings well lighted. He declares that the floodlighting has done away with the necessity of a night watchman and has eliminated the nuisance of anyone prowling around the buildings at night.

He also said that the high school in Watsonville is floodlighted and that it has been free from the burglaries and petty thievery frequent among other schools, attributing this fact for the most part to the grounds and buildings being well lighted. Mr. MacQuiddy is also of the opinion that it is merely a question of a short time until all public buildings will be floodlighted for this protection.

W. H. Weeks, the architect of this school, has been more than pleased with the results obtained from the electrical heating system, according to Mr. MacQuiddy.

POWER BILLS FOR ELECTRIC HEATING OF WATSONVILLE SCHOOLS

School	1929 April	May	June	Sept.	Oct.	Nov.	Dec.	1930 Jan.
Mintie White (14 rooms, office, etc.)	$129.00	$48.00	$62.25	$62.25	$62.25	$106.50	$72.00	
Radcliff (8 rooms, office, etc.)..	78.00	71.25	55.50	12.75	13.50	38.25	77.25	$51.00
J. W. Linscott (5 rooms, office, etc.)..	39.40	34.20	31.80	11.40	15.00	36.50	52.20	35.40

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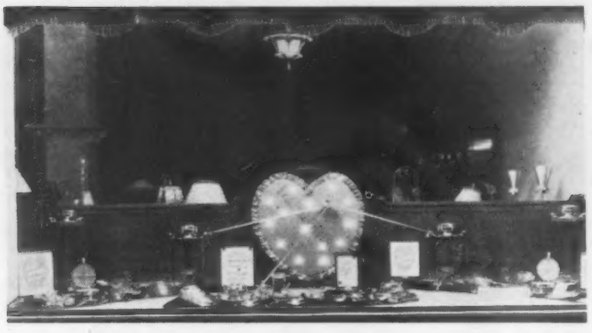


WAFFLES

"Give Her a Kenmore Valentine" window which attracted sales

COMPARATIVELY speaking, the "Electrical Happiness Stores" of the San Diego Consolidated Gas & Electric Company think they have established a record in waffle iron sales. Three hundred and seventy-one waffle irons were disposed of during the shortest month of the year, and if the popular demand had been anticipated to the end of immediate delivery, there is no doubt but what the 500 mark could have been reached.

As a feature of National Waffle Iron Month this company selected the Kenmore and sold it together with a 32-piece rose-tinted glassware waffle service at $14.95. Newspaper advertising, together with clever window displays, put over the campaign in a very pleasing fashion.

The story of electrically baked waffles was carried as load building copy in the daily newspapers throughout the month. This message, besides building up a desire for crisp, golden brown waffles baked electrically, explained in detail the many delicious things that could be baked on an electric waffle iron in addition to waffles. This story was backed by an offer of a free booklet of 24 recipes. The advertising urged the public to either write, phone or call personally for these booklets, and slightly over 2,000 were distributed in this personal manner.

George Washington Never Enjoyed Waffles

"The Kenmore"

Our first president lived in all of the luxury of his time but he never enjoyed the crispy deliciousness of electrically baked waffles.

Today our national breakfast menu includes WAFFLES baked electrically.

February is National Waffle Iron Month

Special Combination Offer!
(February Only)
Westinghouse "Kenmore" Waffle Iron and 32-piece Waffle Service of rose-tinted glassware.....$14.95
Terms. $2 down — $2 for 7 months

Ask for a FREE booklet of 24 delicious recipes—explaining the many uses of an electric waffle iron in addition to baking crisp, golden brown waffles.

"Electrical Happiness Stores"

SAN DIEGO CONSOLIDATED GAS & ELECTRIC CO.

San Diego Oceanside Chula Vista La Mesa
Ocean Beach Escondido Capistrano La Jolla
Coronado

One Waffle Equals One Sale

A unique demonstration of waffle irons was originated by the Public Service Company of Colorado for its February campaign.

A huge replica of a Manning-Bowan waffle iron was conceived by E. M. Rowland, merchandise manager; a design was sketched by Charles Russell, company artist, while the carpenter shop executed the idea. The bottom part was "horseshoed" to allow space for a demonstrator. Constantly supplied with batter, she cooked luscious, appetizingly-browned waffles for prospects.

Some interesting information concerning the amount of batter mixed and the number of appreciative sighs emitted by prospects might be written, but for present purposes it is sufficient to chronicle that each full-sized waffle, divided among four customers, approximated one sale.

These several hundred youngsters unconsciously were an important part of the sales campaign on automatic egg cookers carried on last Easter in Denver under the combined efforts of the Denver "Post" and the Public Service Company of Colorado

EL-EGG-TRICAL SALESMANSHIP

How an Egg Hunt and Egg Cookers Were Cooked Up Together at Easter

PROBABLY none of the 5,000 or more boys and girls who participated in Denver's last Easter Egg Rolling contest realized that he—or she—was helping to sell electric egg cookers. The egg rolling is a big, annual affair conducted under the auspices of the Denver *Post*. Hundreds of parents are always present to see their children perform and they show a vital interest in the occasion. These parents had been informed, through news columns of their daily paper, that the automatic electric Hankscraft cookers were employed to boil eggs for the epic. Moreover, there had been preliminary demonstrations in a window of the Public Service Company of Colorado, showing the process of converting "cackleberries" from a raw to a cooked state by means of a few teaspoonfuls of water which, electrically heated, became live steam in a few seconds.

Consequently, after the egg rolling competition, household conversation naturally centered more or less on the novel contrivance responsible for the hard-yolked henfruit that was being eaten in thousands of Denver homes.

The selling campaign was unique in that it took advantage of various psychologies, employed simultaneously different avenues of appeal, and was so aptly seasonal as to be "made to order."

The Denver *Post*, naturally, was willing to share the expense of its annual classic at Cheesman Park. So, when the Public Service Company of Colorado offered to supply the many thousands of eggs, also equipment whereon to cook them, a bargain was struck.

In each daily story featuring preparations for the contest, mention was made of the electric appliance, the Public Service Company, distributors, and the James H. Blinn Company, jobbers.

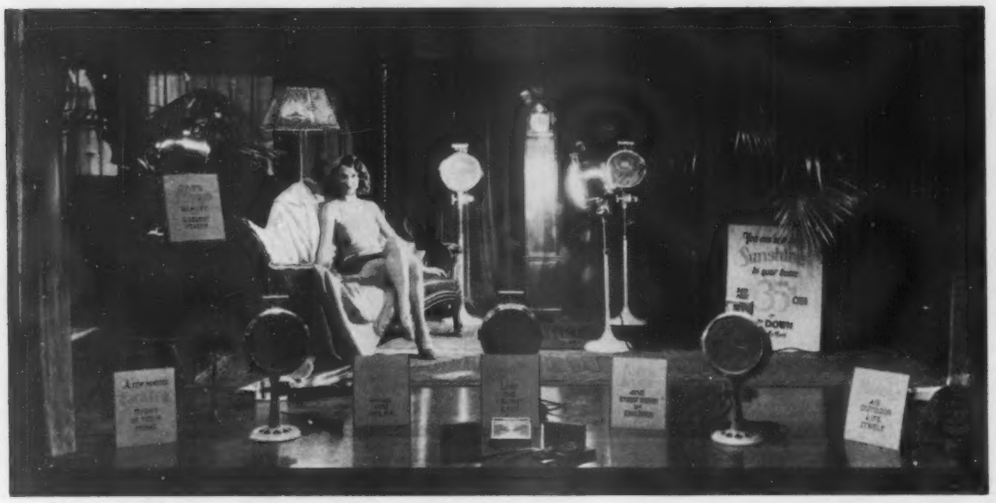
Half a block from the *Post* is the Gas & Electric Building, Public Service company headquarters. In a ground-floor window of this structure an attractive young woman demonstrated the electric egg cooker. Her display table was equipped with a microphone that carried her voice to the sidewalk throngs. This magnifier eliminated the necessity for conventional cards to describe what she was doing; but signs prominently in evidence and the demonstrator's monologue advised the public that eggs to be used in the Denver *Post's* gigantic classic were in process of being prepared.

The demonstrator, seated cozily—as in a breakfast nook—measured out three teaspoonfuls of water and poured it into the small electric cooker reservoir, after plugging in on the electric current, and placed four eggs on the tray. Live steam did the rest, automatically. When the water that acted as circuit-breaker for the electric current boiled away, the eggs were cooked.

Response was not long delayed. Men invaded the Public Service Company's showroom, demanding egg cookers. Many took occasion to thank salesmen for a "big idea" that combined usefulness with novelty and, at the same time, provided a birthday or anniversary present having the merit of being decorative.

A large percentage of spectators who resisted the urge to buy at demonstrations were reminded of it when their children talked about the egg rolling contest. They also had their attention called to the egg cookers when they read their evening paper.

More sales were recorded during the two weeks' campaign than had been made in two years previously, and the local public was made acquainted with an appliance that formerly was little known in this territory.



LEFT: *One of the reasons for the success of the Northwestern Electric Company with sun lamps may be seen in the window display method used here. One of the city's famous Jantzen bathing girls demonstrated the lamps in the window for the passing crowds. During this same time advertising in newspapers was followed up by salesmen in the field and J. B. Buman reported very fair results from the activity*

PICTURED IDEAS

Which Tell More Than Ten Thousand Words

SINCE so much of selling depends on showing, and since pictures show better than words, the selling and display ideas here presented provide a quick means of assimilation. Window displays are the catalog of the electrical merchant. Naturally then, the display of merchandise in them is most important. In these two pages several types of window display are shown. The variety of merchandise, too, is great. Yet each is appropriately prepared for the particular selling idea it represents. Electric clocks are associated with time the world over. Sun lamps are associated with the tan of sunshine in the swimming season. Contrast between the "good old days" and the better new days, with their respective appliances for housekeeping, is the theme of another window.

FRIGIDAIRE
JANUARY · FEBRUARY · MARCH · APRIL · MAY · JUNE · JULY · AUGUST · SEPTEMBER · OCTOBER · NOVEMBER · DECEMBER
YEAR 'ROUND REFRIGERATION

ABOVE: *Outside the store at the front entrance the large globe shown here revolves constantly. It is a proved method for catching the eye and calling attention to the company's advertising appeal based on wide acceptance of the product. This is to be seen in front of the Maytag shop in Oakland, Calif.*

CENTER: *Poster stamps, gummed and ready for pasting on all outgoing packages and mail, have long been a popular type of advertising. That shown at the center of the page was used by the P. F. Pickette Company, Frigidaire distributors in the Spokane territory. It was a brightly colored stamp, focusing attention upon the refrigerator at the center*

LEFT: *Contrast is a powerful force and nothing so shows the attractiveness and desirability of the modern electrical appliances than to have them placed side by side with the crude implements which had to be used before their advent. H. R. Ecklund, Electragist of San Rafael, opened his new store with this display. A band of lavender, suggestive of the "mauve decade," and a band of golden yellow down the center divided the past and the present appliances*

RIGHT: *Correct time in different parts of the world, with a map above to add interest, aroused much comment and stopped many passers-by at the Third St. entrance to the Edison Building in Los Angeles. Large wall clocks, with labels telling in what city the time shown was then correct, and small domestic clocks among them, told the story of electric time*

開ける扉が出來ます。遮斷器は熱度指針が調和點の定めた處迄動くと自動的に開くやうになつて居ります。此機關がなされた時に遮斷器が開いて電流がオブンのヒーターから切れるのであります。

時計と時計のスキツチ

時計のスキツチ板はレーンジの上にある時計の後部にあります。板が左の方に片寄つた時にはスキツチが通じ、右の方に傾した時は切れるのであります。この板は何でも御料理なさる時間が豫定して時計を御使用になる時でなかつたらいつも左の方になくてはなりません。時計を御使用になる時はスキツチ板を右の方に押し、時間で御料理なさるには警報の把手を定め螺旋を卷いてから始めます。一時間とゝめて警報が鳴りますと、時計の後ろにある警報板がスキツチ板を叩きながら左の方へ動きます。

LEFT: *When in Rome, the old saying goes, do as Mussolini dictates. When selling electric ranges, it might be paraphrased, sell in the language of the customer. It is a significant thing that the Westinghouse range cookbook, printed in Japanese, has been a vital factor in giving that range great favor among Japanese customers. The Southern California Edison Company sold more than 100 ranges to Japanese in 1929. The chief sales argument proved to be that electric ranges freed the women from household work for two or three extra hours a day,—time which is spent in the fields alongside the husband*

RIGHT: *In these days the treasures of the household are its modern and attractive appliances. Depicting "Treasure Island" with sand and Spanish Moss, buried chests broken open to reveal electric appliances, and a cake of ice with moss frozen in it to give it wonder and suggest coolness, F. A. Heath, merchandise manager of the West Texas Power & Light Company, Lubbock, Texas, achieved an effect of making the value of the merchandise pre-eminent*

News of the Industry

Undue Importance Given Power Commission Accounting Situation Says F. E. Bonner

Washington Correspondence

STATEMENTS made last month in the course of a House hearing dealing with the Federal Power Commission's appropriations, brought F. E. Bonner, the commission's executive secretary, into the lamplight of publicity. At the hearing in question it became apparent that W. V. King and C. A. Russell, respectively chief accountant and solicitor of the commission, are in active opposition to the policy of Mr. Bonner with regard to accounting work.

Mr. Bonner believes it is entirely possible to administer the Water Power Act in the manner prescribed by Congress. The hearing revealed that he regards the Federal Power Commission as a co-ordinating agency and that most of the work should be done by the three departments now having authority in connection with the use of water. His opponents, Messrs. King and Russell, have indicated that they are strongly of the opinion that the commission should have its own personnel. O. C. Merrill, Mr. Bonner's predecessor as executive secretary, held similar views.

Messrs. King and Russell contend that failure to have an adequate accounting force attached directly to the commission has made it impossible to carry on the accounting work contemplated by the act. Colonel M. C. Tyler, the commission's chief engineer, took the position that if the law had been complied with from the beginning and the accounting problems submitted to the respective department to handle with its own force, the work would have been done long since. "The law was not complied with," he said, "and in ignoring the law the commission's staff has made a problem where none should have existed. No serious effort ever has been made to obtain full use of the accounting facilities of the executive departments. The contention that the executive departments cannot audit accounts is untenable. They have been auditing accounts for many, many years before the Federal Power Commission came into being."

Based on the revelations before the House committee, the Interstate Commerce Committee of the Senate has undertaken to inquire into the situation. The substance of testimony before the committee by Messrs. King and Russell is to the effect that many of the companies seeking licenses are covering into their costs many items which they think should not be allowed. Mr. Bonner takes the position that "no legitimate public interest has suffered by the determinations having been delayed." While admitting that prelicense cost is important, he says its importance has been greatly exaggerated. He points out that the act provides for recapture at the end of 50 years at the net investment which is not to be in excess of fair value. He anticipates that the valuation at the end of 50 years, rather than historic cost, will govern. He also called attention to the fact that many of the project works will have been retired completely before the end of the 50-year period and that all of the work incident to the establishment of their cost is for no purpose. Attention also was called to the fact that the probabilities are that the government will not actually recapture the properties at the end of the 50 years but will simply renew the license. For these reasons he thinks undue importance has been given the accounting work.

FRANK E. BONNER

Mr. Bonner will be remembered in the West for his long service as the California representative of the Forest Service, and later of the Federal Power Commission. In accepting the position in Washington eight months ago on the Power Commission executive committee, he became heir to a particularly difficult situation. Since he had no hand in the controversy which happened to come to a head after he took the secretarial job he became the "goat." Secretary Wilbur has called attention to the fact that the goat always meets trouble head on. This characterized Mr. Bonner's attitude at the hearings. He demonstrated that he has an unusual grasp of the whole hydro-electric situation. He long has been in the government service. He grew up with the water power act. By expressing the opinion, in answer to a question by the Senate investigators, that the power companies are being persecuted, he called down upon his head the invectives of Senator Norris and Senator Wheeler, but this flare of their displeasure is not expected to prevail against his long record of public service and his unqualified endorsement by public ownership advocates, as well as private operators, with whom he long dealt during his term in the West with the Forest Service. There is every reason to believe unfounded published reports that he would be removed from office. Instead prospects favor his selection as one of the full-time commissioners, should that change in the commission organization be authorized by Congress.

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Vote on Utility Districts Sought by Oregon Grange

Steps have been taken by the Oregon State Grange to place before the people at the general election in November of this year a constitutional amendment providing for the formation of utility districts "for development, distribution, disposal and sale of water, water power, and electrical energy." The amendment has been drafted, has been given a ballot title by the secretary of state, and it is understood that an initiative petition will be put in circulation shortly to secure sufficient signatures to place the proposal on the ballot.

The amendment is an enabling act under which utility districts may be formed in territory contiguous or otherwise, including one or more incorporated municipalities with or without territory outside such municipalities, for the purposes above quoted, and providing for the management of such districts by a board of five resident directors. Such districts are empowered by the act, among other things, to levy taxes upon taxable property, to issue evidences of indebtedness, to enter into contracts, to exercise the power of eminent domain, and to provide a supply of water and electric energy within or without the territory of such districts.

Objection to the ballot title has been raised on the ground that it does not mention any of the extraordinary powers of taxation granted to the districts under the act.

Newark Substation Addition Will Treble Capacity

With the laying of spur tracks into the Newark substation of the Pacific Gas and Electric Company, work has been started on additions to the plant, which call for an expenditure of more than $2,000,000 and will treble the present capacity. The additions to the station are specifically designed to receive power developed on the company's Mokelumne River hydro-electric development, now in course of construction in Amador County. Energy will be introduced into the Newark station over a 220-kv. transmission line.

The additional installation will consist of seven 24,000-hp. transformers and two 33,000-hp. synchronous condensers. One of the outstanding electrical engineering features of the substation will be the installation of a 60,000-volt underground cable, the first of this voltage to be used on the company's system.

When completed, the Newark substation will have six separate sources of hydro-electric power from which to draw energy. In addition to this, steam-electric power may be fed into the station from the recently completed steam plant at First and Grove Sts., Oakland, with a capacity of 82,500 hp. The steam-electric generating plant at San Francisco, which is now undergoing extensive enlargement, ultimately to have an installed capacity of 300,000 hp., will also supply energy into this distribution center.

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Many Americans to Attend Berlin Power Conference

Lively interest is being exhibited throughout the United States in the fourthcoming Second World Power Conference to be held in Berlin June 16-25. A number of engineers from the Pacific Coast will be among the American delegation. This country will be one of the leading participants in the conference, and already more than 60 papers by Americans have been announced for presentation, sponsored by associations such as the American Society of Mechanical Engineers, the American Institute of Mining and Metallurgical Engineers, the National Electric Light Association, the Bureau of Standards, and the National Industrial Conference Board.

The majority of the papers deal with the distribution and utilization of electricity. In this connection the papers relating to the problems of the distribution of energy by means of long-distance lines should be of great interest. Still more interest, however, is likely to be awakened by the treatises on the utilization of electricity in the aluminum industry and in the household, and on the electrification of railways. A large number of papers are devoted to steam-power plants, internal-combustion engines and liquid fuels.

Some interesting facts are to be expected from the treatment of water-power stations and water-power storage. Several papers will deal with questions of standardization, the education and training of engineers and employees, and the part played by legislation in matters of power economy.

Transportation arrangements for Americans attending the World Power Conference include chartering of the Hamburg American Liner *Resolute*, the entire first cabin of which has been set aside for the use of American delegates and their families. The *Resolute* will leave New York June 4 and will land nine days later in Cuxhaven, whence a special through train will convey the American delegates to Berlin.

In order to take over the permanent chairmanship of the American World Power Conference committee and to devote his entire time to the preparations for the Second World Power Conference, Oscar C. Merrill has given up his position as chairman of the Federal Power Commission. Further information concerning the conference may be obtained by addressing his office in the Edmonds Building, Washington, D. C.

A Philippine Power Project

A 30,000-HP. hydro-electric power development project is under construction by the Manila Electric Railway and Light Company (Meralco), of Manila, which is erecting a 90-ft. dam of the arch gravity type above the famous Botocan Falls on the island of Luzon, making available a 610-ft. head. The accompanying pictures show the status of construction at the dam site in January.

In true tropical fashion the flow of the river varies between wide limits, but a low minimum has been assumed which, it is already apparent, is far below the actual flow at any time. The average is probably in the neighborhood of 2,000 sec.-ft. Satisfactory progress is being made on a 4,000-ft. tunnel, from 25 to 30 ft. per day being driven from each heading, and it is now more than one-third complete. A 5,000-ft. conduit will convey the water to the power house where the installation will consist of two vertical turbines and an impulse wheel. Power will be carried to Manila over a 110-kv. transmission line. It is expected that the dam will be completed by June of this year and the entire project by the end of 1930. The construction work is in charge of the J. G. White Engineering Corporation, with headquarters in New York.

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Power Co.'s Local Name Will Still Be "Pepco"

Although the stockholders of the Portland Electric Power Company, meeting in Portland, Ore., March 12, voted to change the name of that company to the Pacific Northwest Public Service Company, the company will continue to maintain its designation "Pepco" locally as a sort of trade name. At the same meeting six new directors were named, giving strong representation in the Central Public Service Corporation, the new owner. These new directors are: R. L. Aage, W. B. Brady, D. C. McClure and Albert E. Pierce, all of Chicago; A. J. Johnstone of Portland; and Joshua Green of Seattle, who represents the interests of the Seattle Lighting Company, now owned by Pacific Northwest Public Service.

At a meeting of the directors following the stockholders' meeting, Franklin T. Griffith was elected president for the eighteenth time. Vice-presidents named were O. B. Coldwell and W. H. Lines, both of Portland. R. W. Shepherd, Portland, was elected secretary, and E. W. Clark, 3rd., of Philadelphia, treasurer.

SONNY BOY

Pays the Bills

SOMETIMES F. M. Nott, Denver expressman, can't be annoyed by the duty of walking two blocks to the Public Service Company of Colorado's office and paying his current light and gas bill. On such occasions he writes a check which he hands, with the company's statement, to Sonny Boy, his Boston bull pup. Sonny Boy, ecstatic over this sought-after chore, knows exactly what to do. He races down the street, his teeth gripping the two sheets of paper, waits for traffic lights at the one thoroughfare he has to cross and scampers into the power company's office at the heels of some human customer who has the strength to open heavily-springed doors.

He is very polite, too, is Sonny Boy. He waits his turn in line and, when he has the "right-of-way," leaps to the counter and presents the cashier with the bill and wherewithal to pay it.

Sonny Boy is shown in the accompanying pictures "waiting his turn" at the cashier's window and again in the act of discharging his mission. Dominic Coloroso, the cashier, has transacted business with Sonny Boy before and has no hesitation about reaching for the check; but if anyone else should try to take it—it would just be too bad!

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Idaho Court Prevents City's Purchase of Diesel Plant

The right of the City of Buhl, Idaho, to contract with Fairbanks, Morse & Company for the purchase of a Diesel electric generating plant for $96,984, paying therefor by monthly pledge orders to be liquidated from the revenues of the plant, has been denied by the Idaho Supreme Court.

The main question before the court was whether the city, by entering into such a contract payable solely out of the possible revenues of the plant, would have violated a certain article of the constitution of the state of Idaho placing limitations on county and municipal indebtedness. This clause of the constitution prohibits any subdivision of the state from incurring indebtedness or liability in that year exceeding the income and revenue provided for it for such year without the assent of two-thirds of the qualified electors, or unless provision be made for the collection of an annual tax sufficient to pay the interest on such indebtedness and provide a sinking fund for the payment of the principal in 20 years. The suit was brought by Grant Miller, a taxpayer with the Idaho Power Company, and a number of other taxpayers as intervenors.

In its decision the court referred to the case of Feil vs. City of Coeur d'Alene, Idaho (129 Pac. 643), in which, the decision said, the facts were not distinguishable, so far as questions of law were concerned, from those in the instant case.

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Stewart Mountain Dam and Power House in Service

After making a test run for several days, engineers of the Salt River Valley Water Users' Association of Arizona on March 11 turned water through the power plant at the recently completed Stewart Mountain Dam at an initial rate of 376 sec.-ft., with an electric power production of 600 kw. At the same time the 45-kv. transmission line connecting this plant with the rest of the Salt River Valley Water Users' Association's system was cut into service. An hour later the rate of flow was increased to 537 sec.-ft., which resulted in increasing the electrical production to 1,500 kw. The plant was running at the same output March 12, with the amount of power produced regulated by the quantity of water ordered for irrigation in the valley.

Care is being used by the engineers not to fill the reservoir too rapidly in order to let the concrete set in the dam. The $2,300,000 dam has now become an integral part of the Salt River Valley irrigation and power project.

Tacoma Voters Opposed to Puget Sound Franchise

At an election held in Tacoma March 11 the voters emphatically refused to sanction a blanket proposal which would have authorized the City Council to reissue a franchise to the Puget Sound Power & Light Company to sell power within the city. The present franchise expires June 21, and the company some time ago had refused the new franchise which the city government had tentatively proposed to offer. The vote was 18,478 against and 5,519 in favor of the measure.

Notwithstanding the fact that Attorney Frank D. Oakley, representing the Puget Sound Power & Light Company, declared positively that in withdrawing its application for a franchise to sell power in Tacoma the company had no intention ever again to seek a franchise, the City Council decided to get an expression of the will of the people of Tacoma by submitting the query, "Shall the city give the Puget Sound Power & Light Company a franchise?" to the voters at the March 11 election, simply putting the voters on record.

Homer T. Bone, staunch supporter of the municipal power plant, urged the defeat of the question at the election, declaring that the power company's action in withdrawing its application was of a political nature and "they can renew the application tomorrow if they want to."

The company's representative, Mr. Oakley, declared that the company did not care to make a political issue of the franchise. The company had never acquiesced in the conditions of the proposed franchise, one of which was the surrender of the Pierce County franchise held for the district east of Sitcum Ave., on the tide flats, where 85 per cent of its Tacoma business is derived. Among the business which the company will surrender after its franchise expires will be the street-car load.

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City Seeks Acquisition of Power Company Lands

The California Railroad Commission has issued an order to The Southern Sierras Power Company, Riverside, Calif., to appear at a hearing in Los Angeles, June 10, 1930, to show cause why the commission should not proceed to fix just compensation to be paid by the City of Los Angeles to that company for the lands, property, and water rights of the company on Leevining Creek and Rush Creek in Mono County. This action was taken upon application of the city, which proposes to take over these properties and rights under condemnation proceedings, as an addition to the municipal water and power project.

The properties consist of 240 acres on Leevining Creek at Plant 3 and 589 acres on Rush Creek.

Participants in Accord on Boulder Dam Power

An agreement regarding allocation of power to be generated at Boulder Dam has been reached between representatives of the Metropolitan Water District, the Los Angeles City Board of Water and Power Commissioners, and the Southern California Edison Company. These representatives, with Northcutt Ely, executive assistant to Secretary of Interior Wilbur, assisted in the negotiations by L. N. McClellan, chief electrical engineer for the United States Reclamation Service, with headquarters in Denver, met in Los Angeles and drew up an agreement in the form of a resolution, the terms of which will form the basis of formal contracts to be signed by those participating.

Under the agreement which had been previously arrived at, the State of California is to get 64 per cent of the power to be generated at the dam, with the remaining 36 per cent to be divided equally between Arizona and Nevada. Of the total power to be generated, the Metropolitan Water District is to get 36 per cent; the City of Los Angeles, together with other municipalities, is to receive 19 per cent of the total power from the dam, and the Southern California Edison Company in conjunction with the San Diego Consolidated Gas & Electric Company, The Southern Sierras Power Company and the Los Angeles Gas and Electric Corporation is to be allotted the other 9 per cent.

Under the agreement, the Edison company is the lessee of this 9 per cent but will share this allotment of power with the other utilities.

In the event that Arizona and Nevada do not find themselves immediately in a position to use their allotment of power, the City of Los Angeles and the Edison company agree to underwrite it and use it. In this manner, contracts for the full amount of power to be produced at the dam are assured, according to Mr. Ely.

The price of power to consumers under the contract agreement is to be the already announced 1.63 mills per kw.-hr. for the falling water for primary power. The price of secondary power has not been fixed.

The City of Los Angeles and the Southern California Edison Company, under the agreement, become lessees of the Boulder Dam power plant, each to be given its necessary generating units to be operated as it sees fit by its own personnel, all, however, under supervision of a general secretary to be appointed by Secretary Wilbur.

Installation of machinery, Mr. Ely said, will be made by the government, conditioned upon equitable compensation to Arizona and Nevada in lieu of taxes. The cost of the machinery is to be repaid to the government within a reasonable period.

The power is estimated, minimum, at 550,000 hp. with the 550-ft. dam as originally designed, and at 650,000 hp. with the proposed 25-ft. increase in the height of the dam, which the Interior Department is now considering.

With the 550-ft. height, the power revenue to Arizona and Nevada is estimated at $300,000 annually to each.

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Pacific Coast Gets N.E.L.A. Industrial Heating School

Arrangements have been completed for holding the 1930 N.E.L.A. Industrial Heating School on the Pacific Coast this year rather than in Detroit or some other Eastern city. Because the N.E.L.A. convention will be held in San Francisco it will be possible to recruit a staff of instructors and lecturers for conducting the school from those who will come to the Pacific Coast to attend the convention.

The school will be held in two sections, the first in Los Angeles from June 3-11, inclusive, and the second in San Francisco on June 12 and 13. One of the features of the school will be a series of inspection trips to plants in this section where industrial heating installations have been made. The complete program for the school will be published in the next issue of ELECTRICAL WEST.

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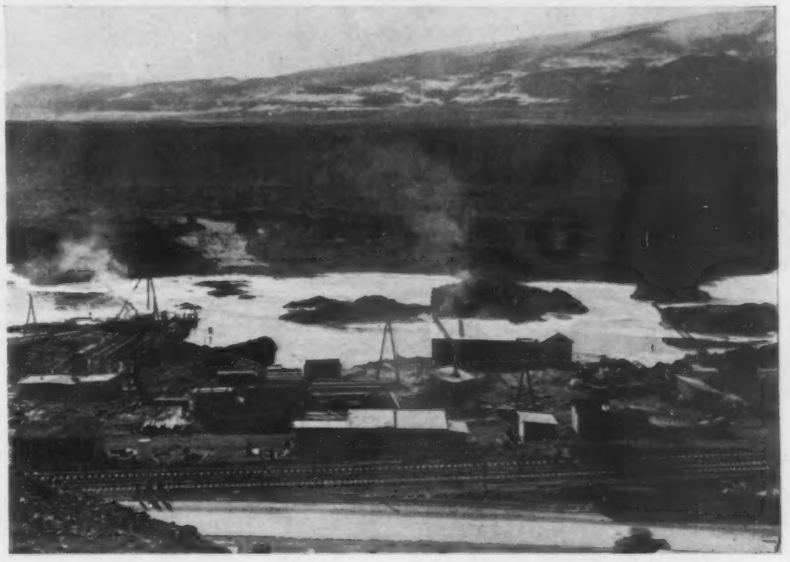
Rock Island Development Site



PRELIMINARY work is under way on the Rock Island development of the Puget Sound Power & Light Company thirteen miles below Wenatchee, Wash. Status of the work at the west channel of the Columbia River is shown here as of last month. Construction of the dam is being carried on by the Stone & Webster Engineering Corporation for the power comapny. Camp has been established, excavation at the power house site has been started, and the beginning of the cofferdam on the west bank may be seen in the left foreground.

Actual damming of the river will be undertaken during the low water season in late summer and early fall. Initial development calls for four units totaling 60,000 kw., while ultimate development, as at present outlined, will total 180,000 kw.

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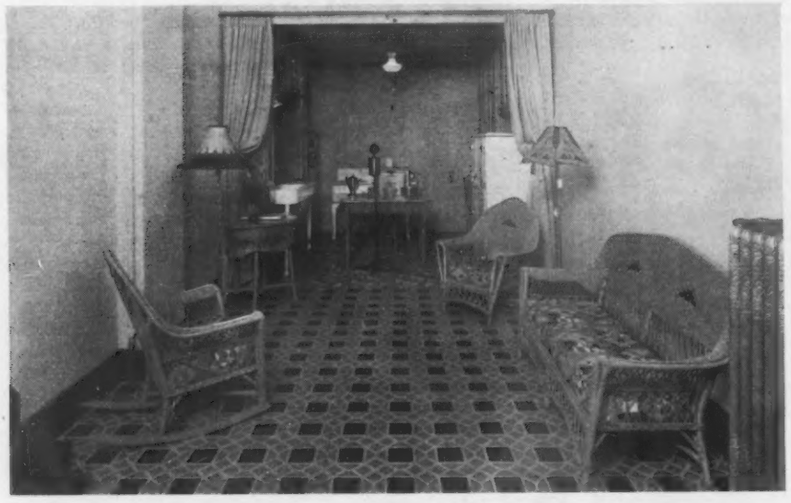
West Has 33% of Nation's Developed Water Power

From a recent report of the U. S. Geological Survey it appears that the total capacity of waterwheels installed in water-power plants of 100 hp. or more in the United States as of Jan. 1, 1930, was 13,807,778 hp., an increase of 236,248 hp., or 1.7 per cent, during 1929.

While the increase in capacity of installed waterwheels during 1929 was the smallest for several years, this should not be considered an indication of a marked change in the utilization of the country's water-power resources, the report states, for water-power plants of about 800,000-hp. capacity are now under construction and are scheduled for completion in 1930.

Thirty-two per cent of the developed water power in the United States is shown by the report to have been in the eleven Western states during 1929 as against 33 per cent in 1928. In 1930 this section will again have 33 per cent of the developed water power of the country. California ranks first among all the states in the country in hydro-electric power development, with 16.4 per cent of the nation's total.

Kitchen Talks Broadcast by Utility's Home Economist



CONDUCTING a daily radio broadcast over station WDAH by remote control from this model kitchen of the El Paso Electric Company, El Paso, Texas, is part of the work of Miss Elise Smith, home economist of the company, who is on the air for one hour every Monday, Wednesday and Friday morning at 9 o'clock, and on Tuesday, Thursday and Saturday at 10 o'clock. Local merchants are co-operating with Miss Smith, and this kitchen club, as it is called, now numbers about 600 members.

El Paso housewives are being instructed through the broadcasts in the art of home economics, household practices, menu making and interior decoration. Miss Smith in preparing the menus explains each step taken and the ingredients used. The whir of electric egg beaters, closing of the range door and other sounds familiar in the modern electric kitchen lend touches of realism to the program.

Public response has been pronounced and the model kitchen hour is now one of the most popular features of the local station. Miss Smith extends an invitation to listeners-in to call and sample foods prepared during her demonstrations, and many people have been visiting the model kitchen since the company began to broadcast.

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Northwest Farms Offered New Irrigation Rate

A new irrigation rate offering a reduction to low load factor customers and a greater flexibility for such customers as desire to use their pumping outfits for incidental use outside the irrigation season, was made effective on the system of The Washington Water Power Company Feb. 20. The rate, it is said, will encourage post- or pre-season pumping for spray water or for water needed in apple washing or other farm or home applications.

The rate starts at 5 cents per kw.-hr. and drops in successive steps to ¾ cent per kw.-hr., based on the use of the maximum demand in kva. per month. A minimum of $2 per kva. of monthly maximum demand is charged for four irrigation months, while for incidental service outside the irrigation season a minimum charge of $1.50 per month applies. Quantity discounts on monthly bills of $200 and up make the rate particularly acceptable to the large customer who, it is said, will receive a saving, depending on demand and load factor, of from 5 to 20 per cent.

The rate will be optional with the old rate of $7 per hp.-month flat charge during the months service was required. It is expected that for load factors above 75 per cent, the old rate will be cheaper.

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NEW LINE TO CARRY ELECTRIC SERVICE INTO MEXICO—The San Diego Consolidated Gas & Electric Company has just completed a new 33-kv. line from its electric generating plant at the foot of Tenth St. in San Diego, to the Mexican border at Tiajuana, Mexico, which will serve the dual purpose of increasing the supply of electricity furnished to Tiajuana and Ague Caliente and permitting the further extension of the service to Ensenada. The San Diego Consolidated Gas & Electric Company does not distribute electrical energy in Lower California, but sells at the border to a Mexican corporation known as Cia. Electricia y Telefonica Fronteriza, S. A. The latter company (M. P. Barbachano, president) has nearly completed construction of a 33-kv. line from Tiajuana to Ensenada, a distance of 68 miles, and to this line the new circuit will be connected. Not only will Ensenada be served and the small gas-engine-driven plant now in use be shut down, but it is expected that several farms along the line will use electricity for irrigation.

Rumors of California Utility Merger Unconfirmed

Consistent rumors of the past month to the effect that a consolidation of public utility companies in California would place under a single management the Pacific Gas and Electric Company, Great Western Power Company and San Joaquin Light & Power Corporation, remain unsubstantiated by either the California Railroad Commission or executives of the power companies involved in the purported merger as this issue of ELECTRICAL WEST goes to press.

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Seattle Steam Plant May Be Converted to Coal

If a plan proposed by leaders in the coal mining industry in Seattle and the surrounding district is accepted by the City Council, the boilers in the Seattle municipal steam plant on Lake Union may be converted and rebuilt to use pulverized coal, eliminating the use of oil at the plant. Coal men declared, in a recent meeting with members of the City Council, that increased efficiency could be effected and the cost of power production greatly curtailed. The councilmen have asked that concrete plans be drawn and submitted for consideration. F. J. Dohrer, of the Wilkeson Coal & Coke Company, presented plans by which the oil-fired boilers could be changed to coal burners, with a saving claimed of two-thirds of a cent per kilowatt-hour.

Councilman Tindall said the plan would work to good effect under the ordinance proposing a $10,000,000 bond issue which is to come before the voters at the March election. Of that amount $400,000 would be used for the steam plant. The ordinance, in part, proposes to construct or purchase and install a steam-electric generating station of approximately 10,000-kw. capacity, including the land, building, steam turbo-generator, and necessary equipment for transforming and controlling distribution of electric power. It also authorizes the construction or purchase of extensions to its existing plant by installing steam boilers of 2,500 boiler horsepower capacity.

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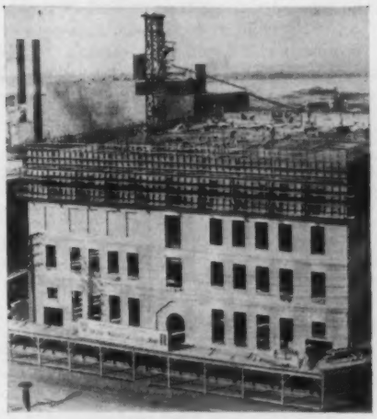
OREGON CAVES TO BE ILLUMINATED—The construction of a hydro-electric plant for generating energy to illuminate the interior of the Oregon Caves, a scenic attraction in that state, can now proceed, according to authorities interested in the project, as Congress has allowed an appropriation of $35,000 for the purpose. A survey of the water power in the near vicinity of the caves has already been completed, and the plans and specifications for both plant and distribution system are in the hands of the federal forest reserve department. With the exception of the application for the appropriation, which was filed by the state, the government forestry bureau is in complete charge of the undertaking for the illumination of the caves.

San Diego Service Building



ERECTION of this $350,000 service building, covering an area of 100 sq.ft. at Tenth and Imperial Sts., San Diego, is one of the major items of construction in the company's 1930 schedule of system improvement. The first three stories will be utilized primarily for the storage of materials and supplies, and the ground floor is at a sufficient height above the street so that freight cars and trucks may be unloaded and loaded with the least difficulty. This floor will be equipped with a complete monorail system, and elevators and chutes of modern types, so as to facilitate loading and unloading operations. The fourth floor is given over almost exclusively to office space, including the offices of the electric distribution and gas distribution departments, drafting rooms for the men who keep the records of the gas mains, map rooms, and test laboratories. In addition there will be a small assembly room in which meetings of the employees may be held.

North and south of the building will be large steel awnings. The north awning is opposite the company's garage, and under this awning construction trucks will be parked at night. Here material will be loaded and unloaded while at the same time the trucks are serviced by the garage crews.

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HYDRO-ELECTRIC DEVELOPMENT PLANNED ON SAUK RIVER, WASH.—Plans for a $6,000,000 hydro-electric power development have been revealed by an application filed recently with the Washington state hydraulics office in Olympia for appropriation of 3,500 sec.ft. of water from the Sauk River, Skagit County, and for use of Sauk Lake as a reservoir, by the Pacific Development Company, of Olympia. Lars Langloe, Olympia hydraulics engineer, is president of the company, and R. K. Tiffany, former state hydraulics supervisor, is consulting engineer. A concrete dam 220 ft. high and 1,200 ft. long at the crest is to impound 380,000 acre-ft. of water in Sauk Lake reservoir, while a fall of 185 ft. is to be used to develop 73,580 theoretical hp. of electric energy.

Washington Water Power Co. Adds to Properties

Purchase by The Washington Power Power Company, Spokane, of the properties of the Kootenai Power Company and the Consumers' Company of Coeur d'Alene, Idaho, and certain properties of the Inland Power & Light Company of Lewiston and Grangeville, Idaho, has been announced by M. W. Birkett, vice-president and general manager of The Washington Water Power Company.

The Inland Power & Light Company, a subsidiary of the American Power & Light Company, acquired the Lewiston and Grangeville properties six years ago and leased them to the Pacific Power & Light Company, which has since operated them. The properties include hydro-electric generating stations at Lewiston and Grangeville, Idaho, and Asotin, Wash. The Kootenai Power Company and the Consumers' Company of Coeur d'Alene were bought last summer by the American Power & Light Company for approximately $1,100,000.

FINANCIAL NEWS

Oregon's Municipal Bonds No Longer Tax-Free

The Oregon State Tax Commission has ruled that all municipal bonds, including those issued for the purpose of financing publicly owned utilities, are subject to the same taxation under the state intangibles tax law that now applies to securities issued by private operators. Municipal bonds bearing interest in excess of $200 must be returned, the commission has announced, and 5 per cent tax paid on amounts over the exemption figure.

Considerable importance is being attached to this statement of the commission inasmuch as bonds issued by municipalities are no longer tax-free and must bear the same burden that the state demands of securities issued by the private operators of utilities.

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Seattle Light Department's Revenue Above Estimates

Exeeding by $240,175 the Seattle lighting department's advance estimates, receipts during 1929 aggregated $5,452,375, according to final figures presented to J. D. Ross, superintendent of lighting, by the department's accountants. The 1929 revenues exceed those for 1928 by $579,689.

The surplus revenue above all operating expenses, interest, depreciation and amortization is reported as $594,314. The total amount of current produced was 364,959,930 kw.-hr., an increase of approximately 19 per cent over 1928, while the peak load was 90,000 kw. as against 76,800 in 1928, an increase of 13,200 kw.

Óf the $13,000,000 in bonds that were issued for the original work on the Skagit project, the construction of the Gorge plant, the department has paid off $3,800,000 since 1924, when the plant was completed, the report shows. The light department redeemed, out of earnings, $1,314,000 worth of bonds last year, and in addition set aside $190,800 for the redemption of bonds due in future years, making a total of $1,504,800.

Because the stream flow at the Skagit and Cedar River was the lowest in 1929 in 50 years, the light department spent $608,454 for fuel oil, as against $286,521 in 1928. Light Department officials had estimated the 1929 expenditure for fuel oil at $240,000.

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WASHINGTON MAY TAX MUNICIPAL BONDS—The possibility of a tax on municipally-owned utilities, now tax-free, appeared recently when John A. Homers, asssitant attorney-general of the state of Washington, delivered a lengthy opinion on that question to the Washington Advisory Tax Commission, which had requested an opinion. He expressed the opinion that an excise or privilege tax could be levied on city-owned utilities, such as waterworks, power plants and street railways, explaining, however, that the question is a close one and undoubtedly would be carried to the courts.

THE BENBOW POWER COMPANY has been authorized by the California Railroad Commission to issue and sell $50,000 of common capital stock, and $80,000 of 15-year 6 per cent first mortgage bonds, for the purpose of financing the acquisition of a site for a hydro-electric power project at Benbow, Humboldt County. Permission also has been granted to issue and sell $50,000 additional of these bonds for the purpose of financing in part the cost of construction of the project.

TIME EXTENSION ALLOWED FOR STOCK SALE—The California Railroad Commission has granted an extension of time to The California Oregon Power Company in which to issue and sell $1,665,100 of its 6 per cent preferred stock for the purpose of refunding an equal amount of 7 per cent stock, from Feb. 28, 1930, until Dec. 31, 1930.

California Companies Report Revenue and Income Figures for Two Years Past

OPERATING revenue and gross corporate income figures of nine electric light and power companies serving the state of California, as reported to the California Railroad Commission for 1929 and 1928, are given in the accompanying table. The gross corporate income figures have been obtained by adding to operating income the non-operating income and deducting non-collectible revenue and rents. They represent the amounts available for interest, amortization of debt discount and expense, other fixed charges, non-operating expenses, dividends and surplus.

COMPANY	Operating Revenue		Gross Corporate Income	
	1929	1928	1929	1928
Pacific Gas and Electric Company	$64,779,455.64	$57,789,955.62	$26,462,128.77	$22,846,292.13
Southern California Edison Company	39,733,980.13	34,688,410.35	22,194,115.14	19,133,832.75
Los Angeles Gas and Electric Corporation	23,783,200.09	22,191,567.47	9,438,434.32	8,450,247.78
Great Western Power Company of California	9,861,422.51	9,089,000.20	6,169,705.70	5,506,061.30
San Joaquin Light & Power Corporation	11,041,709.03	10,160,237.34	5,048,418.29	4,688,111.94
San Diego Consolidated Gas & Electric Company	7,343,935.83	6,860,568.86	2,383,480.29	2,202,026.51
The California Oregon Power Company	1,733,252.90	1,939,652.91	1,733,252.90	1,939,652.91
The Southern Sierras Power Company	1,036,933.47	1,220,397.87	1,036,933.47	1,220,397.87
Midland Counties Public Service Corporation	399,688.98	297,201.93	399,688.98	297,201.93

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Pacific Coast Electrical Association

Commercial Section's Fresno Meeting Is Miniature Convention

ABSORBED by the N.E.L.A., this year's P.C.E.A. convention is being held at odd moments, as it were. The Commercial Section had its odd moment March 20-21 at Fresno, Calif. The odd part of it was that this conclave proved to be quite a sizable, dramatized and animated convention in itself.

The year's studies completed and the annual reports and papers turned in after a morning of committee sessions, the program consisted of a presentation from each of the bureaus of the matter considered by it as of greatest importance to the commercial men in utility companies. These presentations were either in the form of a skit, an illustrated or animated talk, or a moving picture.

George T. Bigelow, chairman of the Commercial Section, opened the first afternoon general session by asking E. G. Stahl, vice-chairman of the section, to report on the N.E.L.A. national commercial section meeting held recently in Chicago. He told of valuable data being prepared on isolated plant conversion, Diesel engine competition, and industrial heating. He said that some companies were making necessary increases in a customer's service entrance and switch when a heavy duty appliance had been sold him.

For the General Bureau stunt Clyde Houston, chairman, presented R. E. Smith and R. G. Kenyon as "Amos and Andy on Public Relations." In blackface, while munching their lunch, these two compared power company selling and service problems to those of the taxicab business and found no reason for the difference in method employed by each.

"Sam Diggintoiler, Stranger—or The Curse of Misunderstanding," an uproariously funny burlesque on the old time melodramas of the nineties, was the vehicle chosen by Fred Foy to present the Power Bureau's idea. This idea was that despite cheap natural gas competition, oil companies which produce the gas still continue to use reliable central station power for all uses, and farmers will do well to do likewise. Fred Foy, Betty Drummond, Garrett Van Buren, Sydney W. Green and Howard W. Sullivan played it for all it was worth.

Vernon Moon, merchandise manager, Pacific Power & Light Company, Portland, was the featured speaker. Graphically illustrating all steps of his company's $1,250,000 sales plan for 1930 by means of slides, he recounted simply and effectively the reasons underlying each step and how it keeps the campaigns under way by a daily check of results.

Thursday evening the conclave was entertained at a St. Patrick's dance given by the San Joaquin Power Club.

Myron McNeal, chairman of the Merchandising Bureau, outlined the work accomplished by the various committees chiefly along two lines: (1) To get more employee use of appliances, and (2) to work out a group contract plan for sales.

A. W. Althouse, vice-chairman, reported on the national merchandising committee conclave at Birmingham, Ala., which he attended. Radio selling methods and results, water heating tendencies favoring complete tank installation, and new residence sales were of outstanding value, he pointed out.

"Meet Mr. Santa Claus" was the playlet vehicle developed by Alma Freeburg, Coast Counties Gas & Electric Company, to present the group appliance contract idea. Pierre Vinet, in introducing the skit, urged its further use to popularize and dramatize the possibilities of the idea. Amby Jones, Jack LaBonte, Tom de Foe, Clyde Smith and Muriel Richards of the Valley Electrical Supply Company made up its capable cast, under Fred Foy's direction.

H. H. Douglass, chairman of the air heating committee, emphasized the value of the heating cost summary in making sales. This summary balances the complete cost of fuel vs. electric heating in matters of insurance, interest, depreciation, maintenance and fuel consumption.

C. J. Cipperly closed the morning session with a rapid succession of pictures of industrial heating installations and crisp, concise descriptions, which also revealed the commercial possibilities "in spite of 14-cent gas."

The commercial cooking committee provided a surprise and a demonstration in the form of an all electrically cooked and prepared luncheon under the direction of Mrs. Tripp of the Valley Electrical Supply Company. Ray W. Turnbull spoke highly of the significant growth in electric restaurant and baking installations and the value of this load.

The conclave was finished off appropriately with lighting. Frank Bevan, Lighting Bureau chairman, repeated an illustrated talk given by him first to the advertising clubs' convention and since then to numerous business clubs. In it he outlined all the types of advertising employed to bring the prospective customer finally to the merchant's store window to see the merchandise and to move him to action for a sale. The window, Mr. Bevan pointed out, was the last and too often the weakest link in the entire chain—because of poor lighting.

Morris Hixon closed the convention program with the presentation of charts showing the losses to power company and lamp manufacturer because of inadequate interior wiring and its effect on delivered voltage.

Use of Machines for Records and Billing Discussed by Accounting Section

MACHINE accounting as applied both to customers' billings and general records elicited the largest volume of discussion at the annual mid-winter conference of the Accounting Section of the Northwest Electric Light and Power Association held in Portland March 17-18. In addition, all other standing committees presented excellent reports, and talks were heard from George L. Myers, assistant to the president of the Pacific Power & Light Company and Northwestern Electric Company, and Dr. Blair Stewart, assistant professor of economics, Reed College, Portland. An added feature of this year's conference, which was extended over two days instead of one as formerly and was attended by 71 delegates, was a banquet meeting at which L. A. McArthur, vice-president and general manager, Pacific Power & Light Company, Portland, talked on what the management expects of accountants.

In discussing "Legislation Affecting Public Utilities," Mr. Myers indicated how the accounting executive is becoming increasingly important to the successful opposition to inimical legislation through the facts he is able to produce bearing on the economics of the utility business. He referred briefly to proposed legislation in Oregon and Washington providing for the formation of utility districts, and also to the proposed federal legislation pertaining to regulation of holding companies and interstate power business. Dr. Stewart discussed the economic fabric of the Pacific Northwest, showing in what respects it differed from the country as a whole and urging the necessity of developing statistical material that would yield a prompt and accurate index of Northwest conditions.

A. C. McMicken, general sales manager, Pacific Northwest Public Service Company (formerly Portland Electric Power Company), welcomed the delegates with a discussion of how accounting and commercial departments could co-ordinate, and how an accounting system should produce facts to enable management to gage its operations accurately. In responding, R. H. Jones, Utah Power & Light Company, Salt Lake City, vice-chairman of the section, brought out the fact that the accountant's responsibility did not end with the production of an adequate historical record, but also demanded a proper analysis and interpretation of such record.

The meeting was presided over by M. J. Wilkinson, Pacific Power & Light Company, Portland, chairman of the section, who introduced in turn the committee chairmen for a presentation of reports, a summary of which follows:

Classification of Accounts Committee

O. W. BENNETT

Puget Sound Power & Light Company, Seattle, Chairman

The committee has confined its efforts to securing adoption by state regulatory bodies of the uniform report as advocated by the National Association of Railroad and Utility Commissioners. Various difficulties have been encountered in all the states of the territory except Idaho, which is the only one using the uniform report at the present time, but some hope of having the report accepted by some of the other state commissions is held.

Customers' Records Committee

N. B. WHITTIER

Pacific Northwest Public Service Company, Chairman

Four papers on different aspects of customer accounting comprised the report of this committee. H. B. Booth, Pacific Northwest Public Service Company, discussed the three important steps necessary for the collection of closed accounts, i.e., the opening of the account, the closing of the account, and the collection follow-up. He showed that the greatest importance was attached to care in securing suitable credit information at the time an account was opened.

The departmental organization and the procedure by which the Utah Power & Light Company handles 51,000 electric and 5,000 merchandise accounts in its Salt Lake division were explained in detail by Gus Anderson of that company.

The advisability of billing merchandise on the same bill as that rendered for service was argued in a paper by F. L. Nagel, Northwestern Electric Company, Portland, which described bookkeeping methods and the billing system of that company for both 30-day and installment merchandise accounts. Discussion arose on the difficulties attendant on rendering a merchandise bill jointly with the service bill, it being generally conceded that this practice involved good collection psychology and was worth the expense it entails.

Making it clear that he was not advocating any particular kind of billing machine for everyone, C. F. Kirchhaine, Puget Sound Power & Light Company, Bellingham, Wash., described the use of the Hollerith billing system in the Bellingham office of his company through which 27,000 electric and 3,000 gas accounts are billed each month.

Fixed Capital Committee

V. T. MONTGOMERY

Idaho Power Company, Boise, Chairman

A suggested grouping of construction costs into units of fixed capital suitable for recording and perpetuating a fixed capital records system was offered in the report of this committee. The entire classification of construction accounts was covered and the units were defined with a view to meeting the most frequently recurring uses to which fixed capital records are put both within and without the company. The report indicated that the tendency in such records was toward grouping related costs into larger units for the purpose of simplifying capital records.

Budget Committee

A. J. JOHNSTONE

Pacific Northwest Public Service Company, Portland, Chairman

This committee had been assigned by the national committee the task of bringing the 1922 report of the national committee on construction budget procedure up to date and of compiling and charting the practices of member companies with respect to budgeting construction expenditures, as gathered by the national committee in 1925. Work on this program has been completed and will be available as a national report if and when approved by the national committee.

Purchasing and Storeroom Equipment

F. W. FITZPATRICK

Mountain States Power Company, Albany, Ore., Chairman

The advantages of the perpetual inventory over the annual inventory and the method of keeping perpetual inventory records formed the main portion of the report of this committee. Some of the advantages of the perpetual inventory plan were cited as follows: It allows for complete inventory or an inventory of a special group of items or of an individual item only at any time; it increases the efficiency of the warehouse; it spreads adjustments over the year's business monthly; it has a tendency to overcome obsolescence; and it tends to keep stock at a minimum.

The methods of six companies for handling and reporting parts robbed from appliances and equipment in the course of rendering service to customers were outlined as a second part of the committee report. It was the consensus of opinion that this practice was inevitable and led to the necessity for an adequate system of making a record of such robbed parts so that appliances in stock could be kept in salable or useable condition.

General Records Committee

G. F. MACKENZIE

Pacific Power & Light Company, Portland, Chairman

The first of three parts of the report of this committee discussed the practicability of using machines for general records work. The report indicated that the use of machinery in any accounting work must be decided by a consideration of the cost, the speed, and the form of the record produced and came to the conclusion that no definite recommendation with respect to any single feature of general record accounting by machines could be made. The report showed further that some of the most valuable time-saving installations come as by-products of machines used for other purposes.

The application of machines to the accounts payable ledger and the system now in use in his company, using the Moon Hopkins machine, was described by B. H. Parkinson, Pacific Power & Light Company. This process involves the producing of a unit posting slip for invoices, preparing invoice register, and posting accounts payable ledger and primary distribution.

A third portion of the report discussed machine accounting applied to cost records, finding certain such records lending themselves to satisfactory use of non-listing machines. This portion of the report advocated in some instances that small differences in a balance be overlooked when by so doing the main aspect of the case is not materially altered. In support of this idea it was pointed out that in one case 12,000 orders totaling over $500,000 were controlled through one account with the balance at the end of the year showing a difference of only $37.

Research Committee

D. F. McCURRACH

Northwestern Electric Company, Portland, Chairman

This committee, which undertakes studies of economic questions and renders reports to the executives of member companies, has reported this year on taxation in Oregon and Washington and is working on a study of wage scales in that territory.

Statistics Committee

B. H. PARKINSON

Northwestern Electric Company, Portland, Chairman

This committee has been attempting to devise an index that will reveal business conditions in the Northwest territory for the benefit of company executives, but no definite plan has yet been evolved. Some of the elements entering into such an index were told by Dr. Stewart of Reed College, whose talk was introduced at this point.

At one point in the program, diversion was offered through the showing of a motion picture entitled "From Mine to Consumer," describing the process in the mining and manufacturing of copper products by the Anaconda Copper Company.

Meetings

Arizona Utilities Convention

A full report of the fifth annual convention of the Arizona Utilities Association, to be held at the Arizona Biltmore Hotel, Phoenix, Ariz., April 16-19, will appear in the May 1 issue of
ELECTRICAL WEST

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U. C. Metermen's Course Set for May 12-17

The seventh Short Course for Metermen will be held in the Mechanics Building of the University of California, Berkeley, Calif., during the week of May 12-17.

This year the classes will be divided into three general groups. Group "A" is elementary and is intended primarily for men who have not had previous meter courses and have had but little meter experience. Group B is more advanced and, in general, presupposes a knowledge of the subject matter of Group A. Group C has been introduced for those whose main interest is relays rather than meters.

A talk of general interest will be scheduled each afternoon from 4:30 to 5:45. Tentative plans call for talks on: (1) Application of Vacuum Tubes to Light and Power Problems, (2) Electric Rates, (3) Legal Obligations of the Metermen, (4) Electrically Charged Space, (5) The Oscillograph, (6) The Relay Demonstration Panel.

The fee for the course is $15. Men desiring only a part of the instruction may attend the course on those days during which the particular instruction of interest to them is conducted at a charge of $2.50 per day.

Further information concerning the course may be obtained from Prof. T. C. McFarland, Mechanics Building, University of California, Berkeley, Calif.

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EL PASO LEAGUE ELECTS OFFICERS—At the recent annual election of the Electrical League of El Paso, El Paso, Texas, the following officers were chosen for the ensuing year: President—L. H. Reynolds, owner of Reynolds Electric Company; vice-president—D. U. Gaston, local manager, General Electric Supply Corporation; secretary-treasurer—J. H. Warden, sales manager, El Paso Electric Company. In addition to the officers named, the board of directors includes P. M. Marshall of the sales force of the General Electric Company; and George Cook, owner of the Cook Electric Company.

California Utilities' 1930 Load-Building Activities Will Aid Jobbers

MORE than 1,000,000 hp. in new equipment will be added to the connected load of California utilities durnig 1930, and in preparation for carrying this additional load the power companies will spend in excess of $75,000,000. These significant statements were made by W. L. Frost, general commercial manager, Southern California Edison Company, Los Angeles, at the recent annual meeting of the Pacific Division of the National Electrical Wholesalers Association held in Del Monte, Calif. The programs of their respective companies first were outlined by A. M. Frost, general sales manager of both the Great Western Power Company and the San Joaquin Light & Power Corporation; P. M. Downing, vice-president and general manager, Pacific Gas and Electric Company; E. B. Criddle, president, The Southern Sierras Power Company; and D. L. Scott, manager public relations department, Los Angeles Gas and Electric Corporation. Then W. L. Frost briefly summarized the facts contained in the talks they made.

Subtracting $33,000,000, which will be paid out for labor, Mr. Frost showed that the remaining $42,000,000 would be expended approximately as follows:

Poles	$ 2,000,000
Pole hardware	800,000
Insulators	1,000,000
Copper	5,000,000
Transformers	7,000,000
Cement	1,500,000
Lumber	500,000
Generators	6,000,000
Miscellaneous	19,000,000

Of the 1,000,000 new horsepower to be added to the connected load, Mr. Frost apportioned 50 per cent to power and industrial heating, 25 per cent to lighting, and 25 per cent to cooking, air and water heating and various domestic appliances.

"In analyzing the effect of our merchandising plans upon the jobber," said

HARRY BYRNE, SR.
1930 Chairman, Pacific Coast Division, N.E.W.A.

Mr. Frost, "I find that orders for the following material will be placed by these six utilities during these twelve months: More than 16,000 electric ranges, 6,400 water heaters, 20,000 air heaters and between 40,000 and 50,000 appliances. This does not include such significant items as electric refrigerators, electric washers, several thousand miscellaneous appliances and more than $200,000 worth of lamps which will be distributed through other channels. Heavy-duty equipment, such as restaurant and club cooking equipment and the like, will bring into the coffers of the electrical industry an additional $100,000 during 1930."

Harry Byrne, North Coast Electric Company, Seattle, was elected chairman of the Pacific Coast Division, N.E.W.A., for 1930.

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Coming Events

American Institute of Electrical Engineers—Annual Pacific Coast convention, Portland, Sept. 2-5, 1930.

Arizona Utilities Association—Annual convention at Biltmore Hotel, Phoenix, Ariz., April 16-19, 1930.

International Association of Electrical Inspectors, Northwestern Section—Annual convention at Hotel Leopold, Bellingham, Wash., Aug. 25-27, 1930.

National Electric Light Association—Fifty-third convention, San Francisco, June 16-20, 1930.

Rocky Mountain Division conference, Denver, April 24-25.

Pacific Coast Electrical Association—Joint convention with National Electric Light Association, San Francisco, June 16-20, 1930.

Engineering Section Meeting, San Joaquin Light & Power Corporation Building, Fresno, April 16-18, 1930.

Purchasing and Stores Section meeting, Fresno, April 16-17.

National Electrical Wholesalers Association, Pacific Division—Thrice yearly meeting, Hotel Del Monte, Del Monte, Calif., May 8-10, 1930.

Talkies Feature Conventions of G.E. Refrigerator Men

More than 500 General Electric refrigerator dealers and salesmen from northern California and Nevada attended a convention held at the William Taylor Hotel in San Francisco March 17. L. H. Bennett, president of L. H. Bennett Company, Ltd., San Francisco distributor of General Electric refrigerators, welcomed out-of-town delegates.

The gathering convened at 1:20 p.m. with F. Morris Rowles, general sales manager of the Bennett company, as chairman. A special feature of the program was the Photophone projection of "Sealed in Steel," a motion picture presentation showing a number of severe tests to which the General Electric refrigerator has been subjected.

On the program were two other Photophone presentations, one entitled

"Pathfinders of Business," an advertising program, and the other, "There's Always Room at the Top With the Toppers," showing the cabinet members' convention in Cleveland.

The principal speakers at the afternoon session were H. T. Hulett, of the General Electric Company, Cleveland, who discussed "Selling on Sight"; A. A. Uhalt, also of the General Electric Company of Cleveland, whose subject was "What Every Woman Knows"; Harry Falkell, of the L. H. Bennett Company, Ltd., who discussed "Selling the Merchants Up and Down Bradstreet"; H. B. Rector, manager of the San Francisco branch of the Bennett company, who showed that "It Costs Less to Own a General Electric Refrigerator"; and H. J. Francis, of the General Contract Purchase Corporation, on "Speaking of Operations."

In the evening a banquet was held at which Harry Falkell acted as toastmaster. Those who spoke included J. B. Wilson, president, Coast Counties Gas & Electric Company, whose topic was, "What the Central Station Recommendation Means to the Dealer"; Hugh Crawford, Pacific Gas and Electric Company, who told "What Electric Refrigeration Means to Public Utilities"; Roy Culp, who told why "It's Great to Be a Topper"; and J. J. Donovan of Cleveland, manager of the apartment house division of the General Electric refrigeration department, who, under the title of "The Shadow of Coming Events" forecast the future for 1930 when he declared that indications point to a 50 per cent increase in business throughout the country during the year.

Under the local sponsorship of Frank Edwards, Inc., the annual regional G.E. refrigerator convention was held in Salt Lake City one week prior to the San Francisco meeting. The 150 distributors, dealers and salesmen present were entertained by the same photophone presentation, playlets and skits that were brought the week following to San Francisco.

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Fruit Sterilizing and Walnut Drying C.R.E.A. Subjects

Investigations into various phases of rural electrification to be conducted during the next year were considered at the spring meeting of the California Committee on the Relation of Electricity to Agriculture held at Fresno, Calif., March 19. At the same meeting Dr. H. B. Walker, professor of argricultural engineering at the College of Agriculture of the University of California, was elected chairman of the committee and Alex Johnson, secretary of the California Farm Bureau Federation, was elected vice-chairman.

The program for the next year includes a continuation of the studies of the effect of light on insect control and upon the flow of air through electric brooders to determine proper ventilation. Also the investigation of various types of electrically operated utility cold storage boxes for the farm will be continued. New projects to be undertaken include an investigation of walnut dehydration, soil heating with electricity, and a study of the sterilizing effects of various types of electric current upon fresh fruit juices. The rural electric short course that has been conducted for the past two years will again be held this fall.

As a result of the committee's studies three new bulletins will soon be available for distribution to farmers and power companies. These cover dairy refrigeration, electrically operated dairy equipment, and the pre-cooling of fruit.

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Colorado League to Hold Convention April 23

The Electrical League of Colorado has announced that its fifth annual state-wide convention will occur Wednesday, April 23, in Denver. This date was chosen because the N.E.L.A. Rocky Mountain Division conference is scheduled for April 24-25 in Denver and a larger attendance is expected by the league through the dates being made coincident.

The League's publicity and promotion committee has scheduled speakers of national prominence in the electrical field to address the gathering. Entertainment more elaborate than on any previous occasion is promised.

Personals

D. C. Green Vice-President of Electric Bond & Share

D. C. GREEN, who relinquished his duties as vice-president and general manager of the Utah Power & Light Company, Salt Lake City, a year ago

D. C. GREEN

to become associated with the Electric Bond & Share Company, of New York, has been elected a vice-president of Electric Bond & Share.

Mr. Green was a prominent figure in the electric light and power field of the West for many years. Early in his career he joined the San Diego Consolidated Gas & Electric Company and later was manager of the Oregon Power Company and the Everett Gas Company, of Everett, Wash.

He joined the Utah Power & Light Company in 1915 and had been vice-president and general manager of that company for five years when he left to join the Electric Bond & Share Company.

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G.E. Man Is President of San Diego Electric Club

HERBERT A. CORDES, the newly elected president of the San Diego Electric Club, is resident agent in San Diego for the General Electric Company.

Following his graduation from the University of Southern California in

HERBERT A. CORDES

1919, Mr. Cordes spent three years at the G.E. factory at Schenectady, and in 1921 he returned to the West and joined the test department of the Southern California Edison Company. Later he was transferred to the construction department of the same company and became identified with the building of the company's Big Creek system. In 1923 he returned to Schenectady and took the General Electric sales course, after which he joined the G.E. office at Los Angeles.

In 1925 Mr. Cordes was appointed General Electric representative in Phoenix, Ariz., and two years later was transferred to San Diego to represent the company in that city.

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LESLIE N. CRICHTON, relay engineer, Westinghouse Electric & Manufacturing Company, Newark, N. J., early in April will complete a six weeks' trip throughout the Pacific Coast territory. He is conferring with power company engineers in all the larger cities regarding automatic protective and control devices. Mr. Crichton joined the Westinghouse organization in 1916 and prior to that time he was for several years with the Telluride Power Company, of Provo, Utah. As an engineer for that company he pioneered the development of many electrical protective devices.

F. S. ("PAT") CURRAN, of the Pacific Gas and Electric Company, San Francisco, has been appointed a special contact man by that company to work with architects, engineers and contractors in the promotion of the Red Seal plan of wiring for commercial buildings. Mr. Curran is replaced in his former work on dealer contacts for the power company by B. W. Reynolds. Mr. Reynolds was at one time in the general office of the Pacific Gas and Electric Company, and later joined the Sterling Furniture Company in San Francisco. During that period he was secretary of the Furniture Dealers' Association, but some time ago he rejoined the P. G. and E. Company.

A. B. LAWRENCE, assistant manager of the switch gear department of the General Electric Company, Philadelphia, was the principal speaker at a meeting held at the Hotel Westward Ho, Phoenix, Ariz., on March 10. He demonstrated and explained to the 50 public utility men present the methods of controlling power with metal-clad switching equipment. J. S. Spurk, switch gear specialist, and H. E. Fuqua, assistant engineer, both of the General Electric Company offices in Los Angeles, were present at the meeting.

GEORGE G. RADCLIFF of Sacramento, Calif., has been named vice-president of the American River Hydro-Electric Company, and general manager of its Sacramento interests, according to announcement of J. W. Mason, president of the company.

CHARLES NEMETZ, president of Electrical Distributors, Ltd., Vancouver, B. C., recently left for an extended business tour of eastern Canadian cities and of United States cities on both the Atlantic and Pacific Coasts. His firm operates a large wholesale business in electrical and radio lines as well as an electric and radio retail store.

GEORGE KIDD, chairman of the board of directors of the British Columbia Power Corporation, Ltd., which controls the British Columbia Electric Railway Company, has been elected a director of the McLennan, McFeely and Prior Company, Ltd., British Columbia wholesale hardware house.

H. G. THIELSCHER, of McClellan & Junkersfeld, Inc., New York, is acting as consulting engineer for the San Joaquin Light & Power Corporation, Fresno, Calif., in connection with the design of its 35,000-kw. steam plant now under construction.

J. J. LITTLE, manager of the Power Corporation of Canada, recently spent some time with officials of the Smithers Electric Company at Smithers, B. C., investigating the possibilities of adding the area to that already served by his firm.

J. D. ROSS, superintendent of municipal lighting, and W. D. Barkhuff, city engineer, were both reappointed by Mayor Frank Edwards immediately after he was returned to office at the election held in Seattle March 11.

Obituary

Death Takes J. J. Buchter of Copco Organization

JOHN J. BUCHTER, merchandise manager of The California Oregon Power Company and the Mountain States Power Company, with headquarters in Medford, Ore., died in Portland March 6. Mr. Buchter had been suffering from heart trouble for several months prior to his passing.

JOHN J. BUCHTER

Coming first to Medford in 1910 as local manager of the telephone company, Mr. Buchter entered the employ of The California Oregon Power Company two years later as cashier of the Rogue River division. Later he became division accountant, a position which he held for several years, following which he was given a responsible position in the home office commercial department.

When the power company entered the electric merchandise field in 1926, Mr. Buchter was placed in charge of the Copco electric appliance stores throughout the company's system. In June, 1929, when the sales departments of The California Oregon Power Company and the Mountain States Power Company were combined, Mr. Buchter was made merchandise manager of both companies, a position which he held until the time of his death.

Mr. Buchter was a veteran of the Spanish-American War and drew a pension for a wound that he received at the battle of San Juan Hill. His passing is regarded as a decided loss to the Copco organization, for which he had been an active and conscientious worker.

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JAMES BLAKE HOWE, general counsel for the Puget Sound Power & Light Company, Seattle, died in that city March 4. Mr. Howe had practiced law in Seattle for 41 years and had been associated with the Puget Sound Power & Light Company interests for the past 23 years.

J. R. Wilson of Quality Electric Works Passes

WITH the death on March 12 at his home at Glendale, Calif., of J. R. ("Bob") Wilson ELECTRICAL WEST lost a valued contributor to its columns. Mr. Wilson was well known throughout contracting circles of the electrical industry for his articles in this and other publications on installation methods, estimating, motor problems and similar subjects.

At the time of his death Mr. Wilson was engineering estimator for the Quality Electric Works, an industrial contracting firm of Los Angeles. He had held that position since 1926 and prior to that he had served for four years as estimator for the Los Angeles Electric Works.

Last year Mr. Wilson served as president of the Estimators' Section of the California Electragists, Southern Chapter. He had been instrumental in the organization of that chapter in January, 1926, and served as its secretary for the succeeding three years. In 1928 he started the magazine, *The Estimator*, of which he was editor until his death. A tireless worker, he was prominent in all the educational activities of the Electragist organization.

Mr. Wilson had been connected with the electrical construction industry for more than 30 years. In the early part of his career he was associated with the Chicago City Railway Company and later moved to Cleveland, Ohio, where he specialized in Class A building installations. From 1911 to 1914 he was city engineer for Hudson, Ohio. He came to California in 1920 with the J. G. White Engineering Corporation to superintend the electrical construction in the $3,000,000 sulphuric plant of the General Chemical Company at El Segundo, Calif. Following completion of his work for that company he was active in the electrical construction field in Los Angeles, both in building construction and industrial plant installations. In 1922 he joined the Los Angeles Electric Works.

J. R. WILSON

Mr. Wilson is survived by a widow and four children.

ON TO ENSENADA

MEXICO this year is the popular excursion ground for convention and business tour parties. Most of these go by rail. The California Electragists, Southern Chapter, however, plan to repeat their successful convention of last year and return to Ensenada, Mexico, by water. The complete satisfaction of all who attended last year has created a large public demand for the repetition of so happy a form of convention excursion.

Frank J. Connolly, executive secretary, announces that arrangements are now complete for the chartering of the steamship, *Emma Alexander*. The schedule calls for its departure at 5 p.m. from Wilmington on May 2, arriving at San Diego at 7 a.m. Saturday morning, May 3. From there it will proceed to Ensenada, arriving Saturday at 1 p.m. and spending the remainder of the day there. At 11 p.m. the ship will lift anchor for the return trip, arriving at San Diego again at 10 a.m. Sunday morning and at Wilmington at 4 p.m. Sunday evening, May 4.

To accommodate all contractors who want to go reservations were limited to contractor-dealers until March 20. After that date invitations were extended to other branches of the industry.

The convention business program will take place in the social hall of the ship en route. A review of the past year's activities and an announcement of the plans for the year to follow will be made at that time. These sessions will be brief and so organized as to present the maximum of business in the minimum of time.

Entertainment and social features are planned for practically every minute of the time on board. At Ensenada last year it was found that the delegates enjoyed so much the visiting of Ensenada's points of interest that no program could be followed. A number of the active committeemen on last year's program will again take charge of various features of the excursion.

Last year the boat trip was particularly attractive to families. Ample entertainment features were provided for women and children who were on board. Deck games and sports, dancing, singing and entertainment numbers, and just plain lounging on the deck chairs, made the affair a delightful one for all.

To the ladies—the deck chairs were specially popular. Ethel Sanborn, Helen Mikesell Kistler and Lois Mikesell as the picture of contentment

Believe it or not, many were on the wagon

A "broadcasting" system (public address system) had been installed by English Electric Company and was used for music and announcements.

Reservations are still being taken by Mr. Connolly at 609 Cotton Exchange Building, Los Angeles. Last year every berth on the boat was taken early so that Mr. Connolly this year has asked that reservations be made as soon as possible.

Ensenda's municipal plant which President Arbogast's Bob Lee has since converted to transmission line power from San Diego

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N.E.C. Committee Members From West Return

Representing the Northwest and the Southwest on the Electrical Committee of the National Fire Prevention Association at its recent meeting in New York City were several men prominent in inspection activities on the Pacific Coast.

F. D. Weber, secretary-treasurer of the Northwestern Section, International Association of Electrical Inspectors, and chief electrical engineer, Oregon Insurance Rating Bureau, Portland, was the official delegate, one of the seven members representing the I.A.E.I. L. W. Going, chief electrical inspector, Portland, also attended as an alternate. While in New York Mr. Weber attended an executive board meeting. He is third vice-president of the association.

Representing the Southwestern Section were R. H. Manahan, chief of the department of electricity, Los Angeles, and Claude W. Mitchell, secretary-treasurer of the section and chief electrical engineer, Board of Fire Underwriters of the Pacific. These two delegates also attended the executive board meeting. Mr. Manahan is the Southwestern representative on the Electrical Committee.

Visits to manufacturing plants and a tour of the new Chrysler Building were features of the trip.

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THE GLENDORA ELECTRICAL MAINTENANCE COMPANY, 134 N. Michigan Ave., Glendora, Calif., is a new firm specializing in installations in the citrus packing industries. The firm was organized by C. P. Malcho, for several years chief electrician with the Union Rock & Gravel plant at Azusa, Calif.

THE MAGNOLIA ELECTRIC COMPANY, Riverside, Calif., has removed from 2587 to 6574 New Magnola Ave.

Electragists Plan Trade Practice Conference on Contracting

DEFINITE steps looking to the organization of a trade practice conference for the electrical contracting industry were taken by the executive committee of the Association of Electragists, International, at its mid-winter meeting, held March 10 and 11 at the association's headquarters in New York City. L. E. Mayer of Chicago, president of the A.E.I., has appointed L. K. Comstock, New York City, chairman of a special committee on trade practice conference procedure to draft rules for fair practice in the industry.

Based upon a two-year study by the trade policy committee, of which J. A. Fowler is chairman, of methods proposed for curbing economic wastes resulting from unsound credit policies, the executive committee has endorsed the plan recommended by the National Association of Credit Men for credit control in the building industry.

C. L. Chamblin, San Francisco, chairman of the standardization committee, emphasized the economies and improved service to be effected for the industry and the consumer in reducing the present excessive number of varieties and types of electrical construction materials necessitating the useless burden of duplicate stocks. As an initial step in a sound standardization program, the executive committee adopted a recommendation that the A.E.I. advocate the industry standardizing as rapidly as possible upon metallic-coated conduit and fittings.

Of fundamental importance in the training of young men planning to enter the electrical contracting business is the committee's action authorizing the introduction into technical schools and colleges of the new Electragists' Estimating Manual. This work, which was published by the association last year and heretofore has been available only to members, is widely recognized as a highly authoritative text-book on electrical construction estimating. It is believed that courses in estimating based upon the Electragists' manual and available to students as a regular subject in the school curriculum, will fill an increasingly apparent need in educating the oncoming generation of electrical contractors along practical lines.

President Mayer announced the appointment of Allan Coggeshall, well known to the industry as an electrical construction engineer of outstanding accomplishments, to head the committee on technical research and engineering.

The committee voted A.E.I. endorsement of the constructive work of the subcommittee on wiring of the N.E.L.A. National Commercial Section in preparing and distributing to architects a folder, "Wiring for Good Lighting in Commercial and Industrial Buildings," containing specification paragraphs recommended to assist in the preparation of plans for adequate electrical installations.

G. W. Forsberg of Salt Lake City was named A.E.I. executive committeeman from the Mountain Division.

Plans for the thirtieth annual convention of the A.E.I. to be held Aug. 18-20 at the Hotel Schroeder, Milwaukee, were approved and a 1931 convention committee named consisting of President Mayer (ex-officio), J. A. Fowler, E. A. Peak, F. T. Langford, and L. W. Davis, general manager of the association.

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ROSEMEAD ELECTRIC COMPANY, 1617 Valley Boulevard, Rosemead, Calif., is a newly opened store specializing in electric and radio appliances and contracting. It is managed by J. W. Montgomery.

Northern Chapter On Boat Ride Also

Too late to be reported in this issue is the annual boat excursion to Sacramento of the California Electragists, Northern Chapter. According to announcement sent forth by Chairman Walter Vance, and Earl Browne, secretary, the affair promises to outdo all previous trips. The river steamer, *Pride of the River*, leaving San Francisco at 6 p.m. Friday, March 28, takes the party to Sacramento, returning the next evening after day meetings in that city. A full report will be given in the May 1 issue of ELECTRICAL WEST.

"All out. End of the line," as Ben Hill said to T. L. Rosenberg on arrival at Sacramento. Ben was up betimes. T. L. was up all the time

VANCOUVER ASSOCIATION—The annual meeting and election of officers of the Vancouver Electrical Contractors' Association has been indefinitely postponed owing to the illness of S. F. Ricketts, of Sydney Darnbrough, Ltd., secretary of the association. Mr. Ricketts has been seriously ill for the past two months, and as there was no immediate reason for a change of officers, the association members decided to postpone the annual meeting of the association, instead of holding it in March as usual.

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Portland Electragists Elect Officers

New officers of the Portland Association of Electragists elected early this year for 1930 are as follows: President—Arthur R. Johnson, M. J. Walsh Company; vice-president—Roy C. Kenney, Ne Page McKenny; secretary—John R. Tomlinson, J. R. Tomlinson Electric Company.

No new activities are to be undertaken in the group at the present time.

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FRED ROGERS, 119 West Pender St., Vancouver, B. C., has just completed the electrical installation in the new Redonda Apartments, 1536 West Eleventh Ave., Vancouver, B. C. This firm is making a specialty of apartment block wiring.

SYDNEY L. WILSON, who has been electric wiring inspector for the City of Victoria, B. C., and the adjoining municipalities of Oak Bay and Esquimalt, has resigned. He has been wiring inspector for the past six years, and now proposes to enter the electrical industry in a more private capacity with a Victoria firm. He will be remembered as the inspector who instituted a unique display at the industrial fair in Victoria, in which he explained to his public the hazards of overloaded wiring and the need for proper fusing.

SOUTHERN ELECTRIC WORKS, INC., is the name of a new industrial and motor contracting firm recently established at 1167 East Sixty-Third St., Los Angeles. Robert J. Hanchett, for some years connected with other motor firms in Los Angeles, is president of the new company, which is capitalized for $25,000. E. B. Morgan is the secretary and Thomas V. Cassidy is the vice-president of the new organization.

BOB LEE, estimator and superintendent of the Newbery Electric Corporation, Los Angeles, has almost nothing to do. At last count he was running a job at Palm Springs in the upper Imperial Valley desert; another at Agua Caliente, the new Monte Carlo of Mexico; another at Winslow, Ariz., and still another at Ensenada, Baja California, in addition to a few local jobs at Glendale, Long Beach and Wilmington. When Bob can't drive, he flies.

Manufacturer & Distributor

Changes in G. E. Supply Intermountain Offices

E. E. Brazier, who for the past ten years has been sales manager of the General Electric Supply Corporation at Salt Lake City, has been promoted to the position of division manager for that company at Denver, Colo. He succeeds John J. Cooper, who has resigned to become manager of the Intermountain division of the Hurley Machine Company.

W. O. Smith will succeed Mr. Brazier as sales manager at Salt Lake City. Mr. Smith formerly held the position of regional specialist in the General Electric merchandise department, with headquarters at Salt Lake City.

J. Harry Christensen of Salt Lake City has been made service manager of the Denver division of the corporation, succeeding Lester B. Johnson, who has resigned to become associated with the General Electric Company's merchandising division in Chicago.

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Oliver B. Lyman Withdraws From Jones-Lyman Co.

Announcement has been made by Jones-Lyman & Company, Inc., and Oliver B. Lyman of the withdrawal of Mr. Lyman from the firm because of matters that require his outside personal attention.

Jones-Lyman & Company, Inc., will continue to do business at the former headquarters of the concern in Los Angeles and San Francisco, while Mr. Lyman has resumed business under his own name with offices in the Call Building, 74 New Montgomery St., San Francisco. He will continue to represent the following manufacturers: Atwood & Morill Company, The Bartlett Hayward Company, Burke Electric Company, I-T-E Circuit Breaker Company, Pittsburgh Piping & Equipment Company, and Sundh Electric Company.

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MOREY, JONES & LOVELL, INC., 922 South Hemlock St., Los Angeles, manufacturers of "MJL" liquid flow indicators, have announced a change in their corporate firm name to Morey & Jones, Ltd. The change involves no difference in management or business policy.

R. O. MORRISON has joined the staff of the Jarivs Electric Company, Ltd., Robson and Granville Sts., Vancouver, B. C., as sales manager of the refrigerator section of the company's activities. This firm is the distributor in British Columbia for the Kelvinator refrigeration system.

Portland Branch Opened for Copeland Refrigerators

Harper Meggee, Inc., distributor of Copeland refrigerators in the Pacific Northwest, has opened a new branch office at Ninth and Everett Sts., Portland, with Thomas J. Tobin as branch manager. The Portland branch will have charge of sales throughout the state of Oregon. Other branches are maintained at Seattle, Spokane, and Butte, Mont. The home office and headquarters of the company remain at Seattle.

In British Columbia Copeland refrigerators are now being distributed by the Radio Sales Service, Ltd., Cordova St., Vancouver. R. D. Lord is in charge of the radio concern's refrigerator division.

Edison Lamp Works Moves to Cleveland, Ohio

The Edison Lamp Works, located for the past 50 years at Harrison, N. J., moved last month to Cleveland, Ohio, where the company's manufacturing, developmental and research departments are located. The G. E. Lighting Institute at Harrison will be maintained as before, in addition to the Institute at Nela Park, Cleveland.

The move had been contemplated for some time, but had been considered infeasible heretofore in view of the large investment in factory and office property at Harrison, as well as because of the fact that it would have seriously affected several hundreds of employees, some of whom have given many years of service to the Edison Lamp Works, and who could not readily be transferred to such a distant point as Cleveland.

A satisfactory solution to the problem was provided with the formation of the RCA Radiotron Company, the office and factory buildings at Harrison offering the newly formed company an ideal location for its headquarters.

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Neighbors in Los Angeles

TWO new buildings that recently have been added to the electrical wholesale center of Los Angeles are those of the Western Light & Fixture Company (above) at 825 East Third St., and the Westinghouse Electric Supply Company, whose new office and warehouse building at 905 East Second St. is shown below. Both have corner locations with ample parking space.

Two Steps Taken to Extend General Cable's Service

Desiring further to improve the service rendered by its divisions on the Pacific Coast, General Cable Corporation has added a field engineer to the staff of its San Francisco office in the person of Oliver R. Grant, who has been with the General Cable Corporation in the East for many years in various capacities involving manufacturing, construction and sales engineering. Mr. Grant took up his new duties on the Coast on March 17.

Another step taken recently by General Cable Corporation divisions to expand their service in this territory was the opening of a new warehouse in Seattle at 570 First Ave. South, where an adequate stock of wire and cable will be maintained. Clarence A. Brown, district manager, is in charge of the corporation's Seattle branch.

R. G. Harris, formerly Pacific Coast manager of the General Cable Corporation, with headquarters in San Francisco, has been appointed manager of the corporation's Denver office.

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THOR COMPANY TO DISTRIBUTE ELECTROCHEF—The Thor Pacific Company, Inc., has been appointed distributor in California, Arizona and Nevada of the Electrochef, the cooking machine that is being manufactured by Electromaster, Inc., of Detroit. The Thor company will also distribute the "fire bowls" manufactured by Electromaster and employing the same heating principles used in the Electrochef. Clarke F. Edwards, 827 West 104th St., Los Angeles, is Pacific Coast representative of Electromaster, Inc., and is in charge of all sales and service of the manufacturer in the states of California, Arizona, Nevada, Washington and Oregon. Sales are being made through dealers as well as power companies.

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Justly Proud of Thor and Hotpoint Sales

The "Four Horsemen" who are largely responsible for the fact that more Hotpoint and Thor products are sold in the Northwest per population than in any other section of the United States. Left to right, R. J. Cordiner, Seattle, Northwest representative of the Edison General Electric Appliance Company; H. C. Frost, Portland, Northwest representative, Electric Household Utilities Corporation; R. G. Chamberlain, Seattle, vice-president, Electric Household Utilities Corporation, and in charge of Thor sales in the eleven Western states; and R. W. Turnbull, San Francisco, Pacific Coast manager, Edison General Electric Appliance Company

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POLE TREATING COMPANY TO EXPAND PLANT—The plant of the National Pole & Treating Company in Everett, Wash., is to be improved and expanded to increase its capacity from five to eight cars a day, at a cost of $70,000. Installations will include a new creosoting unit, including two treating vats with a capacity of three cars daily; a pipe line will be constructed, and roll-ways extended.

W. H. ROGERS is affiliated with the new Los Angeles office of The Bristol Company, of Waterbury, Conn., as a sales and service engineer.

TO HANDLE JOHNS-MANVILLE PRODUCTS—The firm of Wayland Company, Ltd., engineers and contractors, has been organized by Clarke E. Wayland with offices at 563 Second St., San Francisco, to specialize in the sale and installation of Johns-Manville products in northern California and western Nevada.

TRUMBULL ELECTRIC MANUFACTURING COMPANY has moved its San Francisco headquarters from 595 Mission St. to 432 Fouth St. The A. G. Manufacturing Company also moved recently to that location.

FRIGIDAIRE OFFICIALS VISIT PACIFIC COAST—R. F. Callaway, assistant general manager, and H. F. Lehman, installation and service manager, Frigidaire Corporation, Dayton, Ohio, recently made a trip through the West, visiting Pacific Coast branches of the company and completing plans for the 1930 sales campaign. Mr. Callaway is optimistic about prospects for 1930 and has set up quotas in this territory exceeding 1929 sales, which in turn bettered 1928 sales by 25 per cent.

GUY COOPER, Pacific Coast division manager of the Warren Telechron Company, Ashland, Mass., left Los Angeles, where he makes his headquarters, the latter part of last month for an extensive trip including San Francisco, Portland, Seattle, Spokane, and Vancouver. From Vancouver he will sail for Hawaii, where he will spend some time with The Hawaiian Electric Company, distributor of Telechron clocks in the Islands.

H. F. HARTZELL, vice-president and general manager, Maydwell & Hartzell, recently returned to Los Angeles from an extensive trip in the East. Mr. Hartzell attended a national sales conference of the James R. Kearney Corporation in St. Louis, and visited the Eastern factories of a number of manufacturers represented on the Pacific Coast by Maydwell & Hartzell.

LUMINOUS TUBE CORPORATION ORGANIZED IN SEATTLE—The Luminous Tube Lighting Corporation, Fourth and Virginia Sts., has been incorporated in Seattle with David Roderick president and general manager, and B. C. Beck vice-president. G. J. Kallander is secretary. The company will develop electric luminous tube lighting, especially "cold white light" in luminous tubes.

TO REPRESENT ILG ELECTRIC IN NORTHWEST—W. B. Michaels of Seattle has been named Northwest representative of the Ilg Electric Ventilating Company, Chicago, manufacturer and distributor of electric fans, blowers and unit heaters. Mr. Michaels' headquarters are in the Dexter Horton Building.

JOINS THERMADOR DISTRIBUTORS—A. N. Nielsen, formerly associated with the Majestic Electric Appliance Company in San Francisco, has joined the sales force of Fickling & Chaffee, Ltd., in Los Angeles, wholesale distributors of the Hoffman Thermador.

G.E. TO SUPPLY ELEVATORS FOR TACOMA BUILDING—A contract for installation of four high-speed passenger elevators in the new Medical and Dental Building, Tacoma, has been let to the Tacoma office of the General Electric Company, on a bid of $100,000.

PAUL R. PRIETSCH, general manager of Gordon Prentice, Inc., left Seattle recently for Cleveland to attend the annual meeting of the General Electric refrigerator distributors and salesmen.

New Equipment

Iron With "Button Nook"

A "button nook" or slot in the lower edge of the new Hotpoint Calrod Super-Iron makes it easy to iron under buttons and eliminates the danger of pulling off or breaking buttons in the ironing process.

Another improvement in this iron that has been announced by the Edison General Electric Appliance Company, Chicago, is that it will hereafter be finished in chrome plate, which will not discolor or tarnish. List price, $6.—ELECTRICAL WEST, April 1, 1930.

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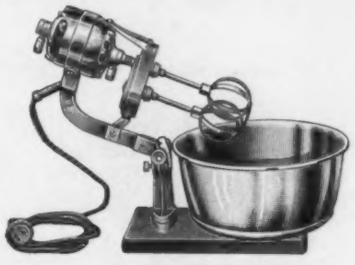
Universal "Mixabeater"

The Universal electric "Mixabeater" recently placed on the market by Landers, Frary & Clark, New Britain, Conn., beats eggs, creams butter and sugar, prepares meringue, whips cream, and mixes all kinds of batters except the very heavy dough-like mixtures.

A double rheostatic switch in the motor gives the twin beaters seven different speeds, and by means of an adjusting screw on the frame the beaters may be adjusted to the correct height from the bottom of the pan. A large and a small nickel silver mixing

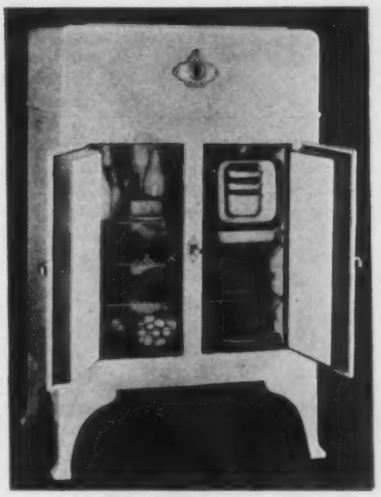


pan and a rotary tray are supplied. The tray allows the large mixing pan to be revolved by hand, bringing every portion of the batter into contact with the beaters. The motor and frame can be swung back out of the way when desired, as shown in the illustration, and when it is in this position batter that drips from the beater falls back into the pan. The beater has a 0.75-amp., 35-watt motor that operates on alternating current only. Retail price, $25.—ELECTRICAL WEST, April 1, 1930.

Westinghouse Refrigerator

Several new features of design and operation are embodied in the new Westinghouse refrigerator, distribution of which began on Feb. 1 in a selected territory between Pittsburgh and Detroit. Motor and compressor operate in an hermetically sealed case with no attention from the user. A blower fan, to increase the refrigerator's efficiency, takes its power from the main motor by magnetic rather than mechanical means. The refrigerant is sulphur dioxide and the freezing mechanism is placed above the food compartment.

The refrigerator is manufactured in five models, rated according to their



interior capacities, but only the width varies in each size of cabinet, the standard height of 60 in. and depth of 27 in. being the same in all models. Standardization is further carried out by the units, which are built in two sizes only in order to effect interchangeability.

Outstanding features of the refrigerator are the buffet top, the temperature selector, and the "broom high" legs. The temperature selector, located on the front of the buffet top, controls the temperature within the evaporator. The selector and all hardware are chromium plated. Porcelain enamel or lacquer exterior is used for the outside finish; the interior finish in all models is one-piece porcelain with rounded corners.

Periodically during 1930 distributing centers will be established in other metropolitan centers east of the Mississippi River and north of the state of Virginia, and later in the country as a whole. The distribution plan calls for a general distributor in each of the principal territories who will sell at wholesale to the "metropolitan distributor" and other dealers, and in some cases will operate a retail sales agency also, in connection with his wholesale activities. The localized idea of selling will be a fundamental feature of the merchandising plan.—ELECTRICAL WEST, April 1, 1930.

Electric Kitchen Clock

The latest addition to the line of electric clocks made by The Hammond Clock Company, 4115 Ravenswood Ave., Chicago, is a series of kitchen clocks in five different colors (white, green, blue,

yellow and brown), with white dials setting off clear black numerals. The case of each is of metal and is octagonal in shape, 8½ in. in over-all diameter. The crystal is convex and is sealed to prevent moisture and dust from settling on the dial. A flasher disk shows at a glance whether or not the clock is running. The completely enclosed motor used in these clocks runs in oil and revolves at 225 r.p.m. Retail price, $9.75.—ELECTRICAL WEST, April 1, 1930.

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Time Switch

A new time switch for turning on and off electric current is announced by the Horolectrical Corporation, 216 West Fourteenth St., New York City.

Two models of the switch are offered, both of the same size, 11 in. high by 5 in. wide and 4 in. deep. One model is hand-wound with an 8-day movement, the other electrically wound. The switch is of 60-amp. capacity, and has a universal motor operating on 110-125 volts. According to the manufacturer, the extreme simplicity of the Horolectric switch makes possible the combination of moderate price with high quality.—ELECTRICAL WEST, April 1, 1930.

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EAGLE ELECTRICAL MANUFACTURING COMPANY, INC., 59 Hall St., Brooklyn, N. Y., announces a new commercial toaster element which can be used for replacement in a number of commercial toasters on the market. It is made in 2.3, 2.6, 4.6 and 4.9-amp. capacity.—ELECTRICAL WEST, April 1, 1930.

Carbon Arc Lamp and "Ozonator"

Two new products of the Interstate Electric Company, 4339 Duncan Ave., St. Louis, Mo., are the Handy Sun and the Handy Ozonator.

The Handy Sun is a carbon arc health lamp with a transformer mounted in the base and automatic cut-

off of carbons after 12 to 15 min. of use. The lamp is obtainable in a floor model adjustable to various heights, mounted on rubber roller casters, and a junior table model. The floor model has a 14-in. sanded aluminum reflector with fine meshed screen and 15-amp. arc. The reflector of the table model is of highly polished aluminum with nickeled trim, and a swivel joint allows the reflector of both lamps to be tilted at any angle. The current-carrying capacity of the carbons for the table model is 12 amp. The larger lamp, rated at 110 volts, 50 and 60 cycles, retails for $85; 110 volts, 25, 30 or 40 cycles, $95, complete with 12 sun-

shine carbons and two pairs of dark goggles. List prices of the table model, according to frequency, are $49.50 and $55.

The Handy Ozonator keeps the air fresh in a building without the opening of windows, according to the manufacturer, by oxidizing the noxious gases of vitiated or polluted air. It does not draw upon the outside air, but will quickly rid a room of unpleasant odors or of smoke. The current that it would consume if in constant operation is almost negligible. It measures 7 x 7½ x 5 in., weighs 7½ lb., and is available in a choice of several colors. Retail price in the West, $20.—ELECTRICAL WEST, April 1, 1930.

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Hairdressing Set and 8-Inch Fan

Two new Star-Rite items have been placed on the market by The Fitzgerald Manufacturing Company, Torrington, Conn.

A hairdressing set consisting of an electric curler, waver and drying comb will appeal to women who must dress their hair quickly at home. Either the curler or waver rod may be quickly attached to the barrel with a spring tension that is positive and clamps the hair firmly. The comb is to be used for drying the hair quickly and thoroughly after a shampoo. Retail price with permanent cord attached to curler, rosewood, $1.25; blue, $1.45. Curler

with detachable plug, rosewood, $1.60; blue, $1.75.

The new Star-Rite 8-in. fan has an over-size motor and is fully guaranteed. It runs smoothly and noiselessly, according to the manufacturer, operates on alternating current, and is supplied in induction type, 60 cycles, with a switch in the base. The fan is obtainable in either black or brass finish. Retail price, $5.—ELECTRICAL WEST, April 1, 1930.

Moist Air Compartment for Refrigerator

A moist air compartment for restoring and preserving the vital moisture of certain vegetables and foods, known as the hydrator, is now a part of the standard equipment of the Frigidaire, manufactured by the Frigidaire Corporation, Dayton, Ohio.

The hydrator compartment is porcelain enameled with tightly fitting top and scientifically designed ventilating holes. According to the manufacturer,

vegetables which have lost their moisture can be placed in this compartment and restored to crisp freshness in a remarkably short time. Cut fruits retain their flavor in the hydrator longer than ever before. The hostess can prepare sandwiches early in the morning on the day of a party, place them in this device, and be sure that they will be soft and fresh when it is time for them to be served to guests later.

The manufacturer has announced that the hydrator is being made available to present owners of Frigidaires in the same manner as the cold control introduced last year. — ELECTRICAL WEST, April 1, 1930.

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Convenience Outlet

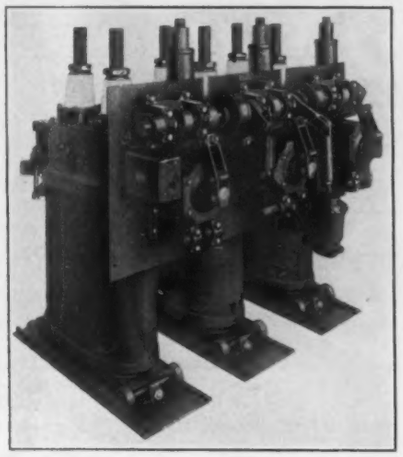
A small, neat convenience outlet, known as No. 494 Service X-it, for use in shown windows, show cases, baseboards, mantles, and other locations, is announced by the Steel City Electric Company, Pittsburgh, Pa. The service X-it has only three parts—the cover plate, the receptacle and the box body, which is equipped with a cord grip device for holding the armored cable, a permanent part of the box that will not come loose.—ELECTRICAL WEST, Feb. 1, 1930.

Oil Circuit Breaker

An oil circuit breaker known as type F-110, of relatively high interrupting capacity and comparatively small overall dimensions, has been placed on the market by the Condit Electrical Manufacturing Corporation, Boston, Mass.

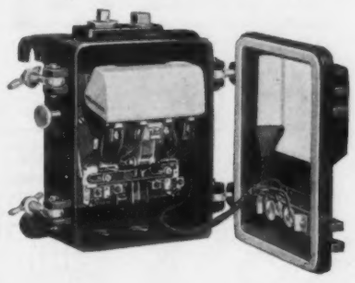
This breaker is of the indoor type, designed for cell structure, truck or platen mounting, furnished for 2,000 amp. or less at 15 kv., with an estimated interrupting capacity of 10,000 amp. at 15 kv.

The frame or pole top is of massive, rugged construction, to afford the rigidity necessary to assure proper functioning of the mechanism and strength to resist unbalanced stress and strain. A deep reinforcing flange extends down over the tank for several inches. The tank is elliptical in shape, strongly welded at ends and bottom and equipped with suitable lining. Short tank bolt construction is used.—ELECTRICAL WEST, April 1, 1930.

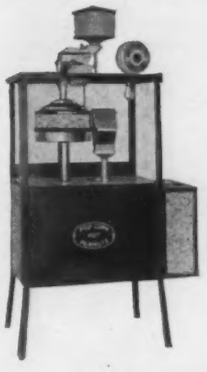


Splash-Proof Starting Switch

The Allen-Bradley Company, 286 Greenfield Ave., Milwaukee, Wis., now furnishes a splash-proof starting switch for a.c. motors used in laundries, creameries, packing plants and other industries where wash down of equipment is essential or where excessive moisture is present. This switch is also designed for dusty installations such as in flour mills and cement plants. —ELECTRICAL WEST, April 1, 1930.



"Wet" Corn Poppers



A line of fully autmatic Frenchflake "wet" corn poppers for commercial use has been placed on the market by Robbins & Myers, Inc., Springfield, Ohio. Model No. 2 (illustrated), with peanut warmer attachment, is designed especially for quick-volume production. It can be supplied in separate manufacturing units, any number of which may be installed in a row on a counter, without cabinets, when this is desired. Requiring only the turning of a switch, the machine performs every operation without further attention other than a refilling of the raw corn hopper and the seasoning feeder when the supply runs low. The corn and seasoning are fed to the popper plate in exactly the right quantities. As fast as a batch is popped, the door in the glass enclosure surrounding the popping plate swings open, the fan starts in motion and blows the corn into the separator where the unpopped grains are separated and the others are discharged into the warming oven. The popper has a raw material capacity of 15 lb. of raw corn and 3 lb. of seasoning.—ELECTRICAL WEST, April 1, 1930.

Recent Publications

KEEPING CLEAN—In a booklet entitled "A Cleaner Home for Less Money," being distributed by The Premier Vacuum Cleaner Company, Cleveland, Ohio, the author, Harriet Cavell, makes it her purpose to show how the percentage of 10 cents out of every dollar which a recent writer in the *American Magazine* showed to be our average expenditure for keeping clean, may be reduced.

PIT LIGHTING UNIT—The Bejamin Electric Manufacturing Company, Des Plaines, Ill., has published a new bulletin describing and illustrating the new refracting glass cover of a lighting fixture designed for use in automobile greasing pits, railway and traction line repair shop pits, wash racks, hydraulic lifts, viaducts, tunnels and similar locations.

G.E. PUBLICATIONS—Recent publications of the General Electric Company, Schenectady, N. Y., include:

GES-402A: "Motion Pictures and Illustrated Lectures." A booklet listing with illustration and brief description the motion pictures (some with sound synchronization) and illustrated lectures (texts and slides) that are available for presentation before schools, colleges, engineering societies and other groups.

GEA-1156A: "Induction Voltage Regulators—Three-Phase."

GEA-1155A: "Induction Voltage Regulators—Single-Phase."

GEA-610: "Railway Signal Accessories."

GEA-1180: Transil Oil No. 10-C—Characteristics and Maintenance."

GEA-1232: "Electric Equipment for Handling Heavy Material."

GEA-946A: "Electric Motor and Control Equipment for Under-deck Auxiliaries."

MELTING TANK—Bulletin No. 170, recently released by H. O. Swoboda, Inc., specialists in industrial electric heating, 3400 Forbes St., Pittsburgh, Pa., contains a description of "Falcon" electrically heated compound melting tanks consisting of channel irons immersed in a tank and insulated from the framework by means of special porcelain insulators. The material appearing in the bulletin is reprinted from a recent issue of *Fuels and Furnaces*.

MOTOR CONTROL—"Practical Pointers on the Selection of Motor Control," by W. H. Costello, an electrical engineer associated with Cutler-Hammer, Inc., Twelfth and St. Paul Ave., Milwaukee, Wis., is a recent publication of that company containing four articles on the subject of motor control that appeared originally in *Power*.

WESTINGHOUSE PUBLICATIONS — Recent publications issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, include:

"Surface Condensers." Leaflet No. 20424.

"Combination Sharples Centrifuge and Filter-Press Oil Purifiers." Leaflet No. 20442.

"Capacitors for Power Factor Correction." Circular No. 1670-B.

"GROUNDING NOTES"—The first issue of what is to be a regular bi-monthly publication under the title of "Grounding Notes" has just made its appearance. It is published jointly by Hubbard & Company, of Pittsburgh, Chicago and Oakland, and the Copperweld Steel Company, of Glassport, Pa.

ELECTRIC TOOLS—A new catalog of its "Ideal" portable electric drills, screwdrivers and grinders, with illustrations and descriptions, has been issued by The Schauer Machine Company, 905 Broadway, Cincinnati, Ohio.

TIME SWITCHES—A new Type S Sauter electric time switch incorporating a 14-day key-wound clock has been made the subject of a recent bulletin of R. W. Cramer & Company, 136 Liberty St., New York City.

ELECTRICAL WEST Barometer of Industrial Activity in Western States

THE second month of the year witnessed a decided upward trend in the rate of manufacturing operations in the Western states, gaged by the consumption of electrical energy by manufacturing companies for power purposes. Operations in this section in February were 10.7 per cent above those of January, as against a gain of only 6.8 per cent for the same period in 1929. In fact the February gain over January is the largest gain for this period recorded during the past seven years, many previous years recording a decrease in operations during February as compared with January. Notwithstanding this gain, however, current February operations in this section were still about 9.5 per cent under those reported for February, 1929.

Five of the industrial groups of the Western states reported an increased rate of operations during February as compared with January, and three reported decreased operations for the same period. Only three industrial groups—chemical products, forest products and shipbuilding—reported current February operations above those of February, 1929.

The forest products industry appears to have witnessed a material increase in the rate of operations during February. Operations in that month were 23.2 per cent above January and about 1.5 per cent above February, 1929.

The metals industry of the Western states also reported a material increase in activity, the February rate of operations being 21.9 per cent over those of January, but still about 30.6 per cent under February, 1929.

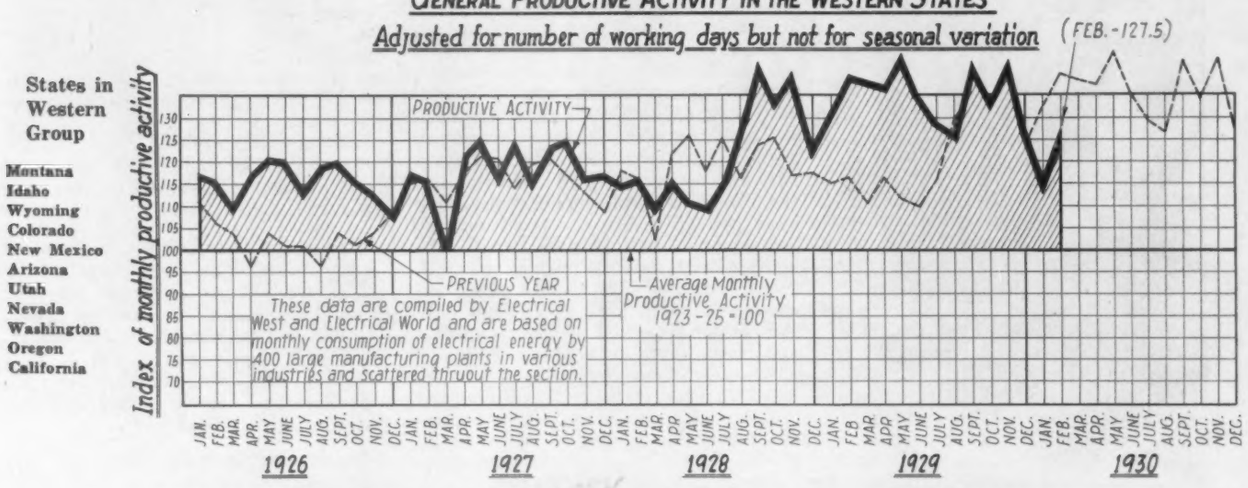
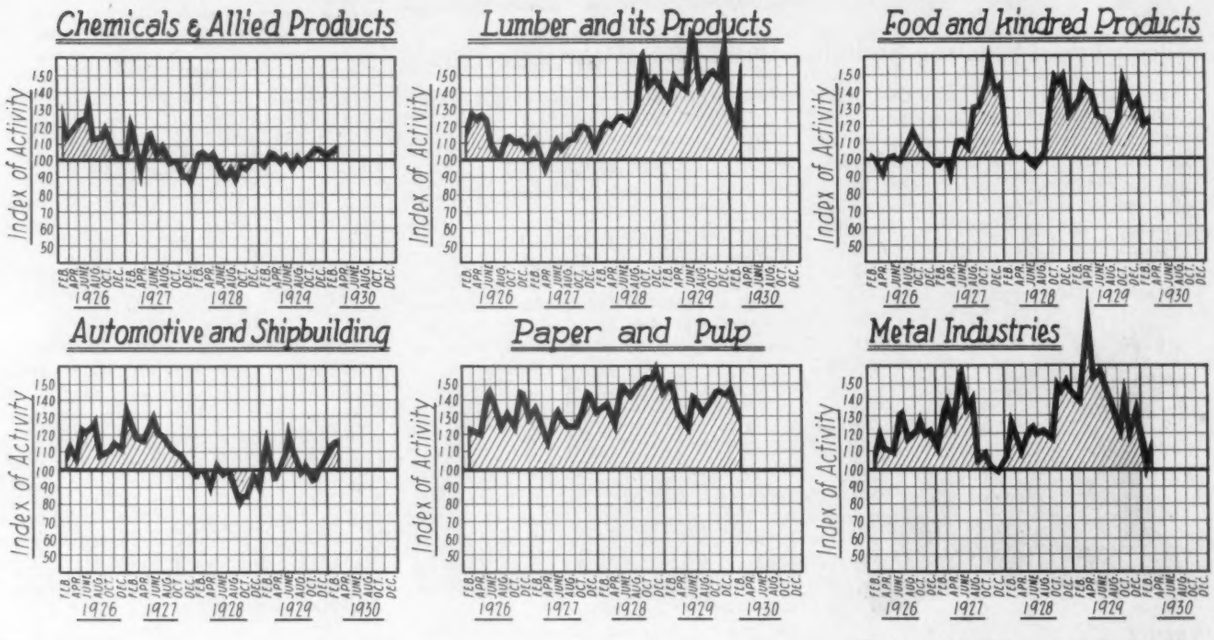
Indexes of Industrial Activity in the Western States

(All figures adjusted for number of working days.)

	Feb. 1930	Jan. 1930	Feb. 1929	Average 1st 2 mos. 1930	Average 1st 2 mos. 1929
All industry	127.5	115.2	140.8	121.3	136.3
Chemicals and allied products	109.8	107.4	100.2	108.6	96.9
Food and kindred products	126.5	124.7	149.3	125.6	143.9
Forest products	155.3	126.0	153.0	140.6	145.6
Metals group	116.4	94.5	167.6	105.4	154.6
Paper and pulp	130.6	137.3	152.3	133.9	152.0
Rubber and its products	164.0	174.0	209.0	169.0	200.6
Shipbuilding	117.5	117.0	94.2	117.2	107.9
Stone, clay and glass	95.2	106.4	129.2	100.8	134.8

GENERAL PRODUCTIVE ACTIVITY IN THE WESTERN STATES

Adjusted for number of working days but not for seasonal variation



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE WESTERN STATES